MINING CONGRESS JOURNAL

JULY, 1940

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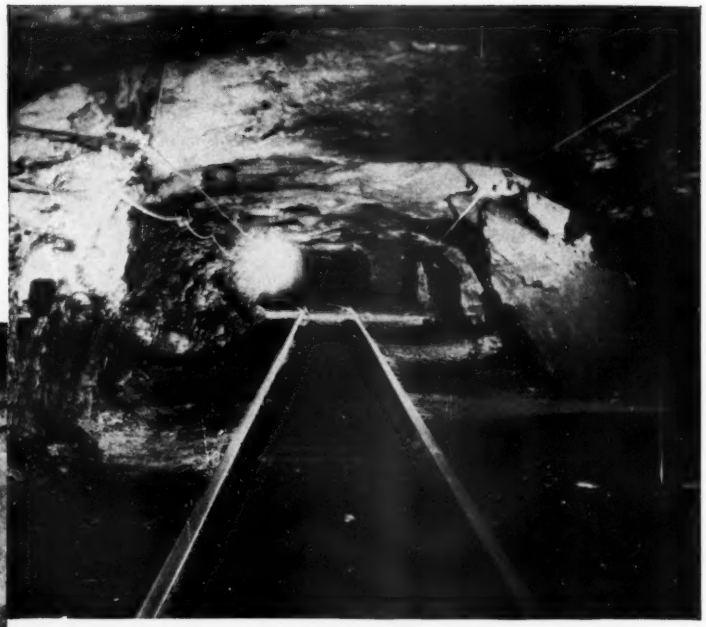

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MINING CONGRESS JOURNAL

Vol. 26 JULY, 1940 No. 7

It's not too early to start laying definite plans for the vacation trip that'll bring you to the big 1940 event in metal mining—the 7th Annual Western Convention and Exposition of the American Mining Congress, to be held in scenic Colorado Springs, September 16-19.

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Be on hand and "get in on the draw" for your share of these valuable attractions.

CONTENTS

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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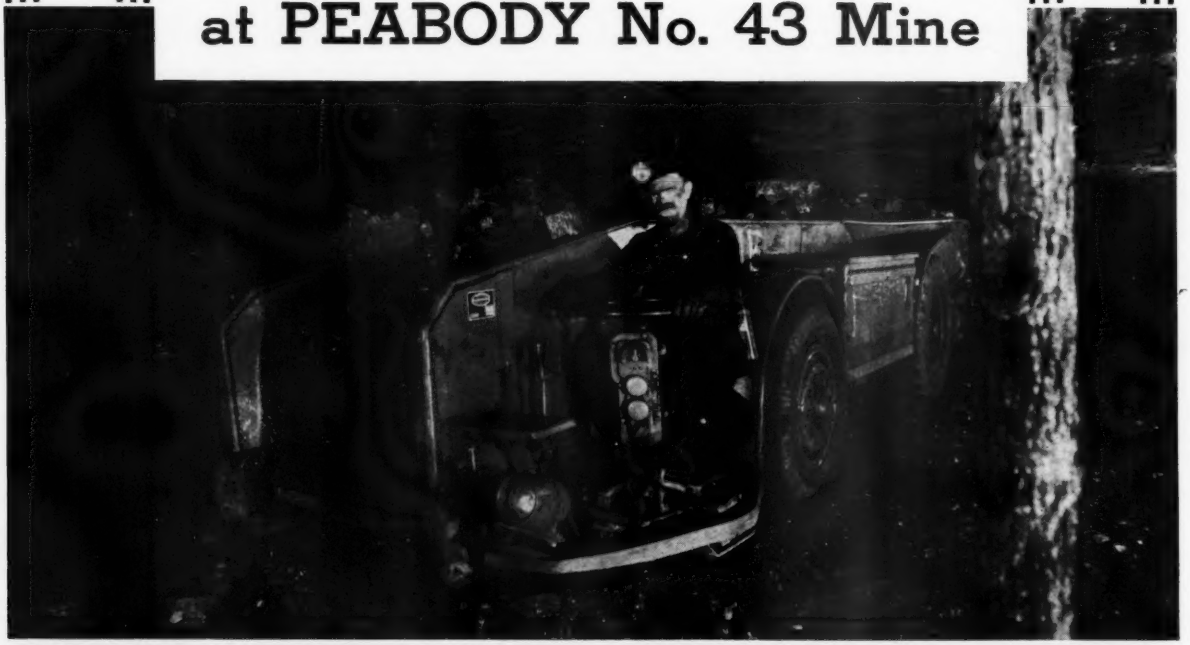

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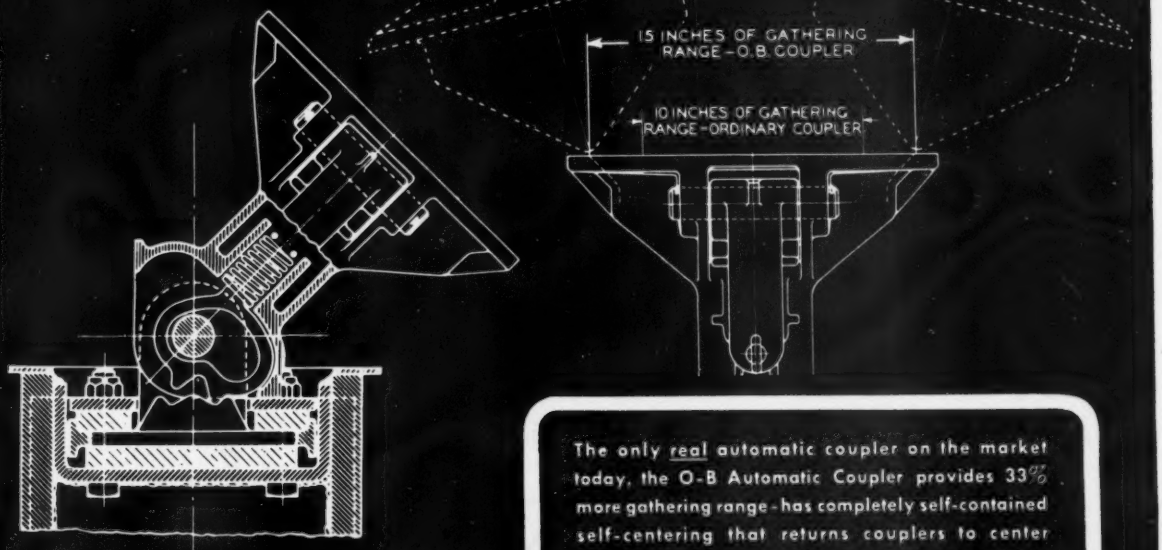

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THE SUPREMACY OF LABOR

WHETHER slave or free, whether independent or under domination, labor is the paramount factor in the comfort of the masses, in the progress of civilization and in the world's greatest horrors—its wars.

Under Hitlerized Germany her workmen have been required to toil as long as 84 hours per week under strict discipline, with every semblance of organized effort for better conditions abolished. During that same period England's and France's industrial workers gave undisciplined service of about 40 hours per week.

Assuming that the undisciplined workers of England and France gave as much service per hour as did Germany's disciplined workers (which is improbable) it took two men in England or France to create the same war equipment as was produced by one man in Germany.

This discrepancy is now being paid for with the blood of England's martyrs, by the annihilation of France, by the desecration and subjugation of Norway and other self-respecting neutral countries, and by a most serious threat to liberty and democracy throughout the world.

A forceful editorial by David Lawrence in the *United States News* points out that labor must sacrifice today or be in slavery tomorrow, going on to say:

"The New Deal, as the friend of labor groups, placed itself early within the control of labor blocs and through the Wagner Act permitted a new system of government to arise in America.

"Coincidentally the 'sit down' strike technique was imported from abroad. Force has superseded reason, compulsion has been substituted for volition. The Supreme Court, dominated by the labor bloc philosophy, approves as does a Congress intimidated by the labor vote. During the last few years the economic vitality of this country has been sapped by abuses of collective bargaining power, aided and abetted by political government.

"The agents of Naziism and Communism could have asked for no better weapon to weaken industrial America * * * *. The hope of America lies in the possibility that the leaders of skilled labor, intelligent labor, patriotic labor, will recognize the difficulties now by taking the initiative.

"Planes and bombing machines have been built by Germany without money, without gold. Sixty and eighty hour weeks have been the rule rather than exception there. Labor has given the Nazis their terrible war machine. Labor in chains has done the job for the Dictator countries."

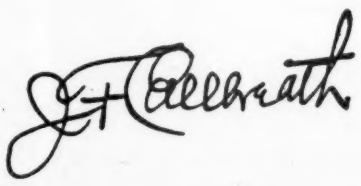
But labor did it—England and France made social reforms, and now are paying a hundred fold for benefits greatly to be desired but dangerous in a world of dictatorships.

Our high standards of living should be preserved. These standards are based on high wages and not on shorter hours of labor; upon plenty and not on scarcity.

The doctrine of spreading employment by limiting hours of service is a doctrine of defeatism. There is no economic law to support it. Four of the six great world powers pay little attention to social reforms. Those four nations are fighting for and rapidly approaching world dictatorship.

Our nation has at last awakened to its dangers. We are endeavoring to meet them by spending six billion dollars to be repaid by the consumers of the nation, a good but not the best way. Without labor the world stops and starves.

The most brilliant intellect, the most dominant leadership must rely on labor for the accomplishment of its plans. The supremacy of labor and the responsibilities of labor are one and inseparable.



A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

Vol. 26 JULY, 1940 No. 7

Richard J. Lund, Editor

A REALISTIC APPROACH TO STRATEGIC MINERAL SUPPLIES

IN CONSIDERING the question of acquiring strategic minerals in the present defense program, it must be recognized that the time element is of paramount importance. The critical need is to secure adequate supplies of these minerals, so vitally needed for national defense, at the earliest possible moment.

Hence a clear distinction must be drawn between the short term viewpoint and that extending over a longer period of time, with present attention naturally focused on the former. Development of domestic deposits, whether the ultimate prospects are favorable or not, necessarily requires far too much time to permit reliance on such sources for immediate needs.

Hopeful indications of eventual help from domestic production were voiced in a recent release by the Bureau of Mines, concerning joint work by the Bureau and Geological Survey in exploring for and developing strategic minerals, which stated that "the general outlook for locating important domestic deposits is definitely more encouraging than anticipated at the start of the search." The complete statement may be found starting on page 47. It is reasonably certain, however, that only few of the promising properties can get into production in the immediate future. It is a matter of record that during the past five-year period domestic mines have produced only the following percentages of the nation's peace time requirements: tungsten, 50; mercury, 40; antimony, 10; manganese, 5-6; chromium, 1; nickel, 0.5 and tin, 0.2. With the exception of tungsten and mercury, these figures are typical of the situation obtaining over a longer period of time. It is encouraging to note that tungsten and mercury are satisfying much heavier proportions of our needs than was the case for some time preceding, indicating that over a period of years advancing technology and new discoveries, fortified by reasonable protection from the products of low paid foreign labor, can go a long way in changing the status of minerals falling in the strategic category.

A little over a year ago, at the request of the Joint Army-Navy Munitions Board, a mineral advisory committee was organized to revise previous reports on demand, supply and reserves of strategic and critical minerals, in the light of present-day requirements and knowledge. The best advice of eminently qualified experts in each mineral field was drawn upon in making these studies, which, in view of their vital military importance, were never made public.

In formulating present plans for the purchase of strategic minerals for armament needs, the Advisory Council on National Defense is drawing freely from data in these studies, supplemented again by advice on each mineral from the best informed men in the country. On the majority of the strategic metals, it has been the unanimous opinion of these groups that, regardless of how good or how poor may be the ultimate possibilities for domestic development of adequate supplies, the present exigency demands heavy foreign purchases at once. In no other way can the pressing needs of the immediate future—measured in terms of days, weeks and months—be satisfied. The considered judgment of such a group of experts should prevail without question in carrying out prompt steps which will provide sufficient amounts of these vitally needed materials.

With the safety and security of the whole Western Hemisphere at stake, and the heavily expanded budget already overflowing with immediate defense requirements, a sane approach to the problem of strategic minerals would definitely appear to be prompt action in acquiring every spare ton of these metals that is available at shipping points throughout the world. Events in the enlarged theater of war operations are moving so swiftly that supply lines may be cut off at any minute, making it doubly important to get what we can while the getting is possible.

Of equal importance, in our estimation, is the long term viewpoint, taking into account the possibility that many of the sea lanes still open may be cut off, and recognizing the vital importance of pushing a sound domestic production program as rapidly as possible.

It is encouraging to know that all this work is in the hands of men who are noted for quick, sound and resourceful action, and that they are surrounded in their critical task by the best brains in the country on each particular problem.

DEFENSE TAXATION

LATE in June the record-breaking Revenue Bill of 1940 was signed by the President, imposing heavier income, corporation and excise taxes; raising the debt limit, and increasing the number of income taxpayers by lowering the exemptions. Only the tragic happenings in Europe could bring about the extraordinary situation whereby Congress ordered a boost in payments from the public's pocketbook in a summer preceding a presidential election.

The Senate, as a matter of fact, went to the extreme limit of passing the bill with the Connally war profits and La Follette excess profits amendments, which would have piled up the tax burdens to staggering proportions. Furthermore, the Connally amendment would have been extremely harmful to mining through its provision to cut percentage and discovery depletion allowances in half.

The American Mining Congress presented a vigorous protest to the conferees against inclusion of these amendments on the ground that they are extremely complicated and would entail drastic and far-reaching effects upon productive enterprise which cannot even be appraised without a careful study and full hearings. In this meeting Senator King, of Utah, performed a real service to mining by his determined stand in behalf of this protest, and fortunately the amendments were dropped.

The subject of extensive tax revision will again be up for consideration later this year. Mining is ready to shoulder its just share of increased burdens to provide for adequate national defense, but must be prepared to analyze carefully the Treasury's proposals and to exert its efforts to see that the burdens are equitably distributed.

Surface plant of Climax—one of the world's largest mining enterprises—is located on the Continental Divide in Colorado at an elevation of 11,300 feet

Ventilation and Dust Control at Climax Molybdenum

● ***Important Progress Made Since 1933 Will Soon be Supplemented by Extensive Improvements—Both Forced Ventilation and Sprays Utilized to Advantage in Mine and Crushing Plant***

By JULIAN W. FEISS
Technical Staff
Climax Molybdenum Company

THE mine of the Climax Molybdenum Company is located at the summit of the Continental Divide about 13 miles from Leadville, Colo., at an altitude of 11,300 ft. above sea level. The crusher and mill are situated at the same locality. The capacity of the entire plant is about 15,000 tons per day.

In view of a previous article in MINING CONGRESS JOURNAL of November, 1937, no description need be given of the underground operation or general mine layout beyond stating that workings throughout the mine have been considerably extended since the time the above-mentioned article was written. In addition, exploratory drifting on the 500-ft. level has continued to the extent that over 10,500 ft. of 5 by 7-ft. drift has been driven below the Phillipson or main haulage level. As regards the old upper levels, little work is being done at present, but development is underway to recover a comparatively small tonnage remaining above this level. Lateral extension of the Phillipson and 500-ft. levels has so increased the working areas that ventilation programs have been required to keep pace with the expansion.

Satisfactory Progress Made Since 1933

Intensive study of ventilation and dust control began in 1933, and we feel that satisfactory progress has been made. There have been large expenditures for heavy duty ventilation equipment, drifting, raising, labor supplies and power. The present fan system is moving roughly 371,000 cu. ft. of air per minute, the system drawing air from the lower workings and exhausting it through the abandoned upper portions of the mine. Visibility is excellent, and, as a rule, dust and smoke are cleared from blasting places within a short period of time.

To accomplish this, five ventilation fans are in use above the haulage level. Of the five fans, two are direct exhausting, two are boosting and one is intaking. Intake air also enters the mine through the Phillipson Tunnel as well as numerous openings in the caved area. For convenience, principal data concerning the functioning of these fans are shown in Table I.

The essential working levels are within the range of the fans listed in Table I, but on the 500-ft. level a separate ventilation system is required to handle this lower zone. Six centrifugal fans are used on the 500-ft. level, the air eventually exhausting through the main system after being eliminated from the lower levels through a shaft to the Phillipson and grizzly levels. These 500-ft. level fans are driven by motors ranging from 5 to 10 h.p., with speeds varying from 1,350 to 3,500 r.p.m. On the average, each fan transmits about 1,500 cubic feet of air per minute through 1,500 feet of galvanized steel tubing against pressures ranging from 3.7 to 7.8 inches of water. Here is where the altitude of Climax is a distinct aid, for if the operation were at sea level the pressures would be about 50 percent greater and in some cases beyond the practical operating range of the fans. At present most of these fans are not in use, as work on this level is confined largely to diamond drilling, and the crews are small.

Novel Method of Jointing Vent Pipe

Mr. Leo Glanville, ventilation engineer for the Climax mine, has devised a method of jointing pipe which is in

TABLE I—PRINCIPAL OPERATING DATA FOR FIVE FANS LOCATED ABOVE HAULAGE LEVEL

Fan type and size	Speed in r.p.m.	Motor h.p	Volume moved Cu. ft.
Exhausting. Aerodyne. 8-ft. Jeffrey 2-stage	898	200	162,400
Exhausting. 7-ft. Aerodyne	1,114	75	132,300
Boosting. 6-ft. Aerovane	989	25	58,300
Boosting. 4-ft. Aerovane	1,018	10	17,300
Intake. 7-ft. Aerovane	774	35	55,800

use on this level. A wrapping joint is made by soaking a strip of brattice cloth (size about 6 x 2 inches) in a medium thick solution of cement and water. This strip is wrapped around the joint of the vent pipe and secured with two binds of No. 12 annealed wire. Figure 1 shows construction details. Once the wrapping sets, an air-tight rigid joint results. Use of this method of pipe junction has reduced resistance and leakage materially, and has proved satisfactory in hundreds of applications.

Air Injectors Effective on Grizzly Level

On the grizzly level where blasting tends to choke the drifts with smoke, fumes and dust, an air injector has been found quite effective. Detailed dimensions of this injector are shown in Fig. 2. This injector (locally called a "bazooka") is designed so as to occupy small space in a 5 x 7-ft. grizzly drift, and it is built sturdy enough to withstand concussion from nearby grizzly chambers. The injectors are made in the mine machine shop with the cones fashioned from sheet iron. They are attached to the air line, and if blown out are easily replaced. With 100 pounds air pressure, the estimated air consumption is 15 cubic feet of air per minute. These injectors are essentially used as boosters to assist in the movement of low velocity air. In grizzly drifts that are often beyond the range of exhausting fans the "bazooka" serves to move the air to within range of these fans, and actual tests made in grizzly drifts indicate that the injector moves roughly 50 percent more air by volume than would be the case without the installation.

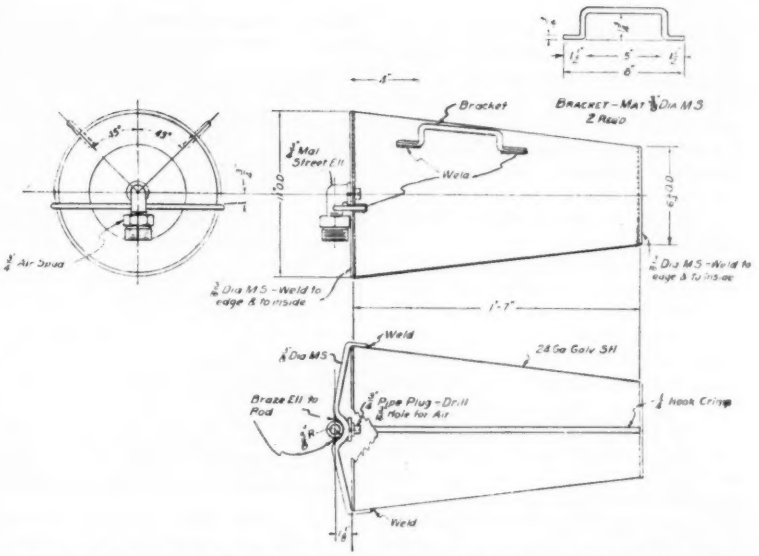


Fig. 2. Details of air injector, locally termed "bazooka," used extensively on the grizzly level

Venturi blower on grizzly level

Future Ventilation Plans Outlined

As previously stated, the increased lateral extension of the mine has resulted in the instituting of a ventilation program to keep pace with the growth. Climax has already commenced work on extensive development for this purpose; details of the

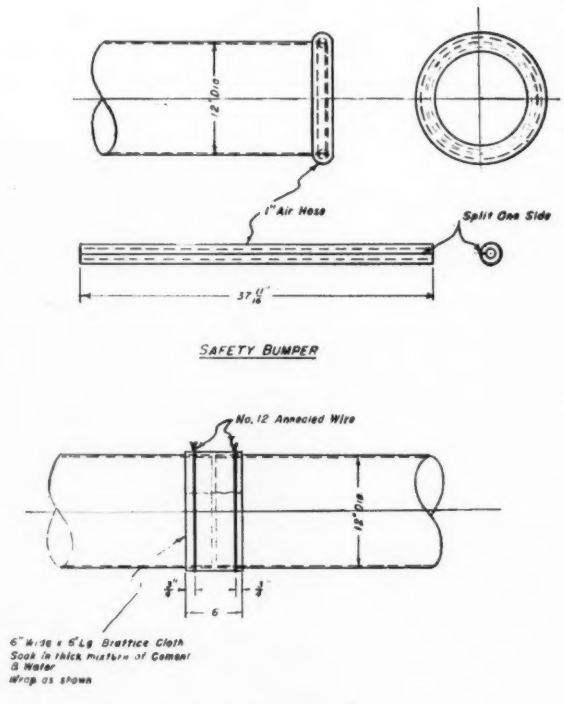
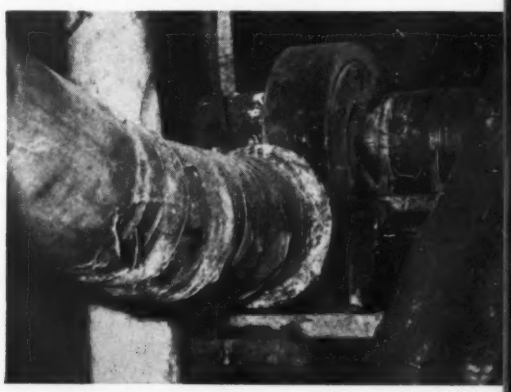


Fig. 1 (left). Safety bumper and vent pipe joint as used at Climax



Right: Blower located on 500-ft. level

program are briefed in Table II and Fig. 3. In the table, the air figures as indicated for the moment are as measured, and those under the proposed column are as estimated. Also, it must be remembered that these figures vary seasonably in many cases, and that circumstances may result in some future changes in the fan installation program.

As will be seen from examination of the map, a system of laterals will serve to direct the air on the Phillipson level in the south block. Doors will enable intake air to be diverted into drifts where it is needed, and cut off from those where no work is taking place. Air will be exhausted into the caved areas above present workings, and the entire volume moved by the fans will be nearly double that as moved under the present system. The drifting and raising will vary in size from 5 x 7-ft. to 8 x 13 ft. in cross section, and some of the present drifts will be slabbed to the larger dimensions.

TABLE II. VENTILATION DATA UNDER EXISTING CONDITIONS AND AS PROPOSED IN THE NEW PROGRAM.

FANS	Present Data.	Proposed.
Number of heavy duty axial flow fans in use	2	6 *
Number of light duty fans in use	3	3
Intake fans	1	4
Exhausting fans	2	3
Boosting fans	2	2
AIR VOLUME DATA (Figures in Cu. Ft./Min.)		
Air moved by intake fans	187,000	287,000
Air handled by exhausting fans	295,000	540,000
Drawn in caved openings	108,000	253,000
Air moved by boosting fans	76,000	76,000
Total air moved by all fans	371,000	616,000
MISCELLANEOUS DATA		
Horse power used	350	675
Cu. ft. air per horse power	1,606	913
Footage drifting and raising for vent purposes	2,232	9,848

* Exact data are not available on the new fans to be installed, three for intaking and one exhausting. From available information, these will possibly consist of two 8-ft. axial flow and two 7-ft. fans. The present light duty fans comprise one 6-ft., one 7-ft. and one 4-ft. unit. These will be retained with no changes contemplated at the moment.

In view of the importance of this system of laterals, a more detailed

Fig. 3. Plan of mine workings showing proposed new ventilation system, with the exception of two fans. Neither the 500 level or grizzly level is shown, but the latter roughly follows the main haulage plan on the left-hand part of the map, being 60 ft. above it. The right portion is operated by slushers, and what grizzly drifting has been done has been abandoned. The circled numbers indicate the localities referred to in resistance table on opposite page

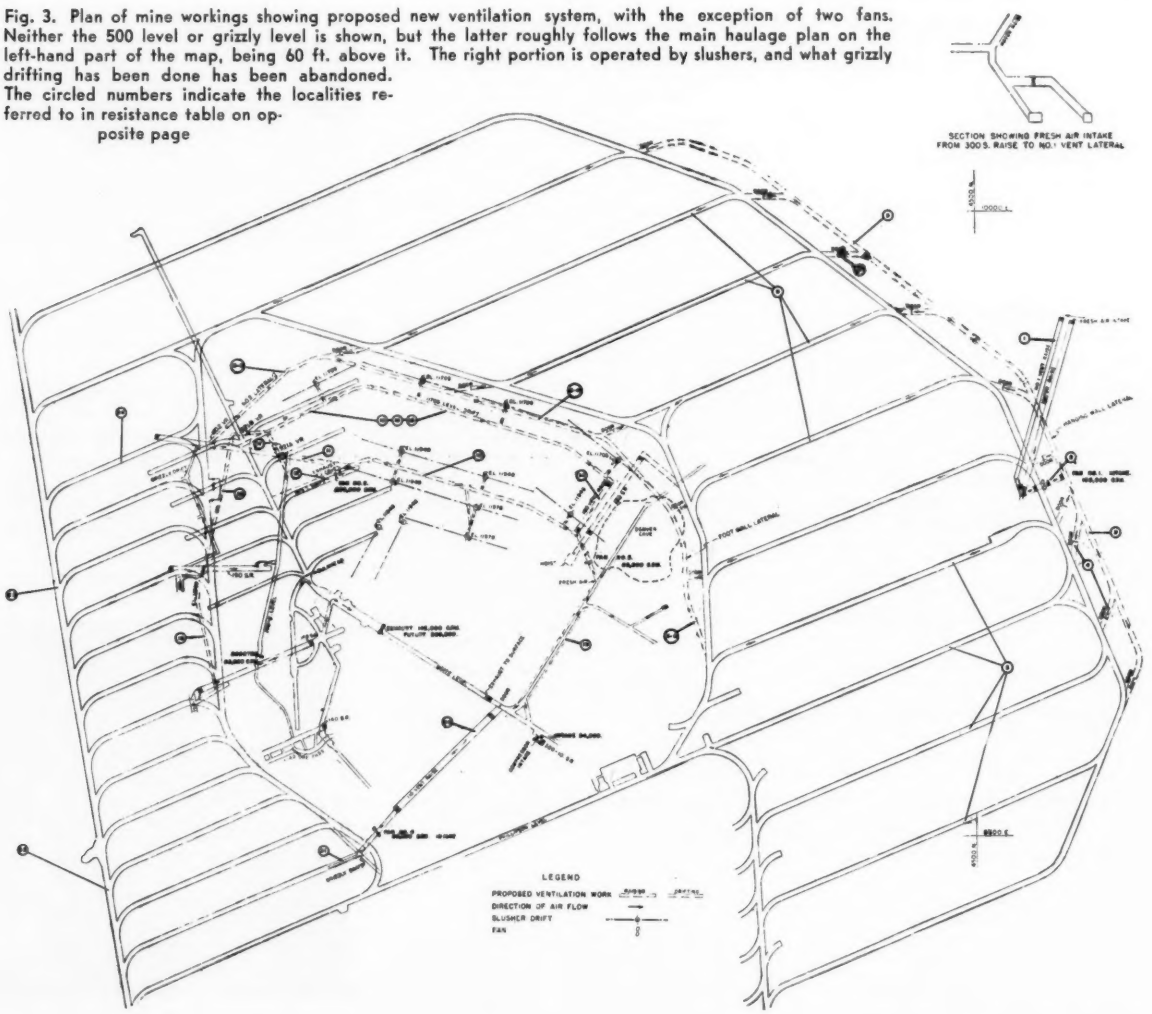


TABLE III.—RESISTANCE DATA FOR VENTILATION CIRCUITS INVOLVED IN NEW PROGRAM. (NOTE: Numbers at top of each vertical column refer to localities shown on Fig. 3)

RESISTANCE TABLE (HANGING WALL LATERALS)

	(1)	(2)	(3)	(4)	(5)
1. Locality	New Water Raise	Vent Raise and Fan Drift	HW Lateral	Entry	Haulage Drift
2. Distance in ft	700	120	550	80	900
3. Cross section in ft	11 x 7	8 x 13	7 x 8	5 x 7	9 x 12
4. Perimeter, ft.	36	42	30	24	42
5. Sectional area, sq. ft	77	104	56	35	108
6. Quantity in cfm	100,000	100,000	50,000	50,000	50,000
7. Velocity in fpm	1,300	960	890	1,430	463
8. Water gage	1.24	0.09	0.47	0.22	0.15

RESISTANCE AGAINST 205 S FAN INTAKE

	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Locality	FW Lateral	FW Lateral	FW Lateral	240 S VR	11705 Drift	220 SR	205 S Drift
2. Distance in ft	570	670	120	140	175	236	50
3. Cross section in ft	7 x 8	9 x 11	9 x 12	8 x 13	9 x 11	8 x 13	9 x 10
4. Perimeter, ft.	30	40	42	42	40	42	38
5. Sectional area, sq. ft	56	99	108	104	99	104	90
6. Quantity in cfm	50,000	100,000	100,000	100,000	100,000	175,000	200,000
7. Velocity in fpm	893	1,010	926	961	1,010	961	1,400
8. Water gage	0.49	0.55	0.08	0.10	0.14	0.18	0.08

RESISTANCE AGAINST 11948 FAN (No. 3)

	(13)	(14)	(15)	(16)	(17)	(18)
1. Locality	11948 Drift	180 S VR	11705 Drift	11705 Run Around	221 Raise	11650 Drift
2. Distance in ft	110	302	770	175	95	610
3. Cross section in ft	8 x 9	7 x 12	7 x 8	7 x 8	7 x 10	7 x 8
4. Perimeter, ft.	34	38	30	30	34	30
5. Sectional area, sq. ft	72	84	56	56	70	56
6. Quantity in cfm	65,000	40,000	40,000	40,000	20,000	20,000
7. Velocity in fpm	1,040	594	893	893	360	447
8. Water gage	0.11	0.10	0.66	0.15	0.01	0.13

RESISTANCE AGAINST 110 GRIZZLY FAN (No. 4)

	(19)	(20)	(21)	(22)	(23)	(24)
1. Locality	Denver Drift	110 VR	110 Gr. Dr.	No. 1 HW Gr. Dr.	No. 1-2 Gr. Dr.	220 Gr. Dr.
2. Distance in ft	400	520	700	700	400	330
3. Cross section in ft	9 x 11	8 x 13	8 x 10	8 x 10	5 x 6	5 x 6
4. Perimeter, ft.	40	42	36	36	22	22
5. Sectional area, sq. ft	99	104	80	80	30	30
6. Quantity in cfm	66,000	66,000	66,000	66,000	15,000	15,000
7. Velocity in fpm	665	630	825	825	500	500
8. Water gage	0.14	0.17	0.43	0.43	0.15	0.12

NOTE ABBREVIATIONS: HW, hangingwall; FW, footwall; VR, vent raise; Gr. Dr., grizzly drift.

Blower installation for slusher drifts

Pipe joint on 500-ft. level. Brattice cloth soaked in cement and water, securely fastened, makes airtight junction when it sets

description will clarify the plan. The circuit will intake through the present water raise and a new raise parallel to it, to a fan situated above the present hangingwall drift as indicated on the plan. This fan will deliver through a raise to the hangingwall lateral, and at this lateral air will split east and west to service the haulage drifts. Regulating doors will control the current in the ten haulage drifts, and a current of about 100 feet per minute can be maintained in each with a total circulation of 100,000 cubic feet per minute. It is assumed that the hangingwall current will be split equally in the lateral with 50,000 cubic feet per minute flowing in each circuit. By stopping down the regulation at entries to inactive drifts, the air can be concentrated into drifts where work is being done and where it is needed. Each haulage drift will have a discharge into the footwall ventilation lateral which should give satisfactory control of air currents in the haulage drifts without the use of doors.

Details shown in Table III illustrate what is involved in overcoming the resistance in various portions of this circuit as well as in some of the other circuits in the new plan. The numbers on the top of each vertical column refer to localities shown on Fig. 3.

Jeffrey exhaust fan on the White level

Wetting Down and Wet Drilling Universally Practiced

As regards general mining practice, wetting down and wet drilling are universally used throughout the operation. The use of water sprays is somewhat limited in some localities due to the extreme cold of the winter climate at the altitude of Climax. Dust elimination underground is regarded as essential as ventilation, and the attempt is made throughout to introduce fresh air in localities where pollution might result. The exhaust air is then eliminated through regions where men are not in contact with the air stream.

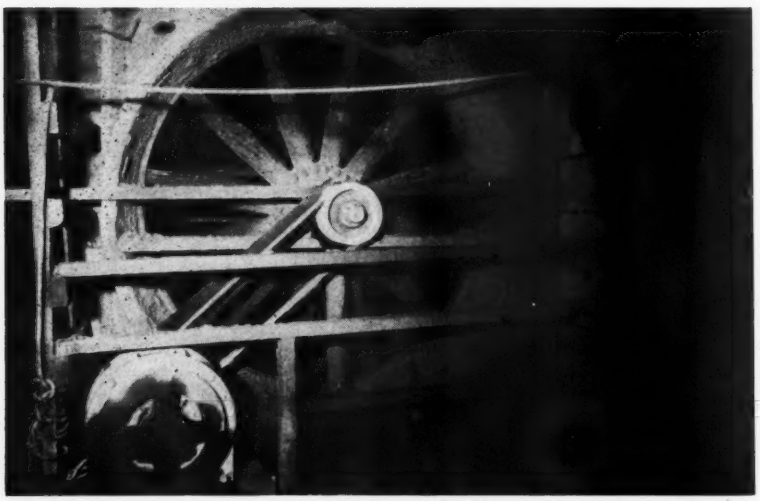
Constant experimenting with new methods and new apparatus is undertaken by the ventilation department. For example, water sprays have been installed in one of the new concreted slusher drifts and a series of 8-hour dust surveys are being made to ascertain the effectiveness of the sprays. Also, centrifugal fans have been installed adjacent to slushers, and although it is still too early to judge the effectiveness of the various methods being tried, a decided improvement has been indicated throughout.

The dust engineer makes periodic inspections embracing all working places and pays special attention to exhaust and intake points, using these points as measures of the effectiveness of the system. Results are studied carefully by the Safety Engineer with a view towards recommendations for improvement and change. The dust counts are analyzed by statistical methods and the work is correlated with ventilation data. The ventilation department takes daily barometric, psychrometric and similar readings. Pressure surveys, using the manometer with pitot tube, are also part of the routine with checks and use of the anemometer.

System Affords Desired Flexibility

In conclusion it should be stated that the system of ventilation control is flexible. Doors and brattices serve to divert and change the direction of air flow in various portions of the mine; this flexibility is needed, as hourly changes at high altitude can cause decided changes in the air flow underground. As regards dust counts and the methods used in reaching conclusions, no results are considered as final unless many samples have been secured over a long period of time. To establish the dust concentration at any locality may require several days of detailed observation with samples being secured almost continuously throughout the day.

It is difficult to give detailed data on an operation the size of the mine at Climax, and on looking at Fig. 3 an idea of the extent of the workings can be secured from the spacing of the drifts. The cross-cuts on the left portion of the plan are driven at 100 foot centers, and those on the right on 200.



Booster fan on the 140-2 level

Dust Control at the Crusher

The dust control system at the crusher, involving four general classifications of dust control methods, aims at the reduction of dust concentration to accepted limits of safety. There are two crushing plants—the old crusher referred to as No. 1, and the new plant termed No. 2. As the older plant is only in intermittent use, discussion will be confined to No. 2 Crusher. A condensed plan (Fig. 4) shows the circuit of No. 2 unit, with elevations and a belt diagram. For convenience in understanding the general crushing practice, a brief resume of the crushing circuit is presented.

Ore from the mine is dumped into two 1,000-ton ore bins. From these bins the ore is fed by two large Ross feeders into two 48 x 60-in. Buchanan

jaw crushers which crush to 10-in. From the jaw crushers the ore is taken by conveyor to a 6 x 10 ft. Robins gyrex screen with 3-in. opening, the oversize from this going to two 7-ft. standard Symons crushers, the undersized joining the crushed material from the standards. The ore is then conveyed by belts to the 1,500-ton surge bins, from where it passes over vibrating screens and magnetic head pulleys in closed circuit with five 7-ft. Symons short-head crushers. The screens have a 5/16-in. opening, and the undersize is carried by conveyor to the mill.

Closeup of No. 2 crushing plant, with No. 1 plant at right

Four Principal Control Methods Summarized

As previously stated, four methods of dust control are in use at No. 2 Crusher unit; these are summarized in concise form as follows:

A. Enclosing of Equipment

1. Wherever possible, large portions of conveyor belts are enclosed, especially at points where ore is transferred to the conveyors.

2. Chutes that drop ore onto conveyors are enclosed.

3. Flaps are provided on the top of the surge bins to prevent dust escapage from within, these flaps being operated automatically by the tripper on the belt that supplies the bins.

4. Curtains are employed on screens and wooden closures attached to feed boxes.

5. Curtains screen off the discharge of the two main Buchanan jaw crushers.

6. Study is being made of the pos-

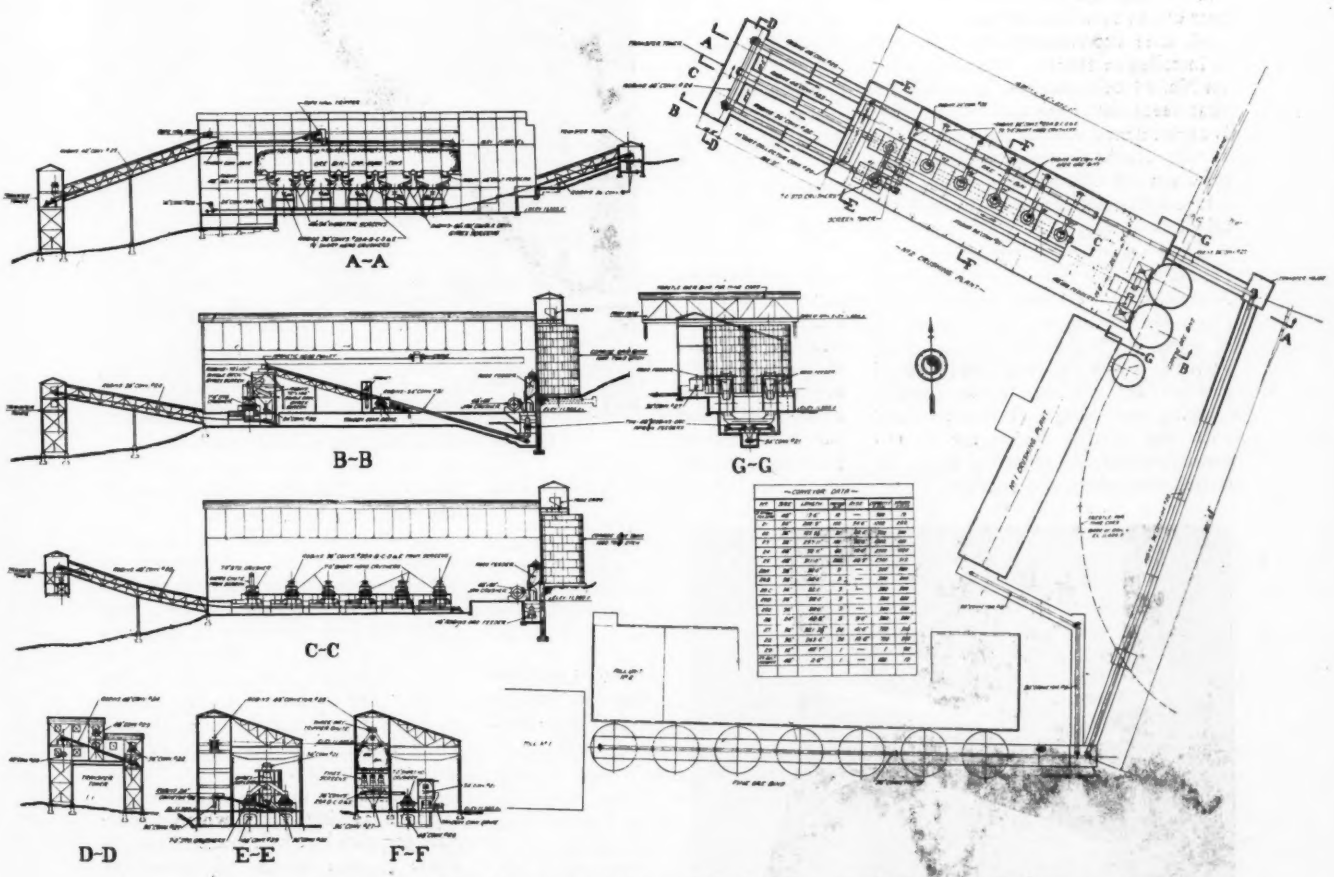


Fig. 4. Plan and section giving a general picture of No. 2 crusher. No ventilation details shown

Exhaust ducts in No. 2 crusher. Note covered conveyor and hoppers at left

Blaw-Knox collector in No. 2 crusher

sibility of enclosing either the entire shorthead unit or portions of it.

7. Study is being made as regards complete enclosure of the screens.

B. Water Misting Sprays

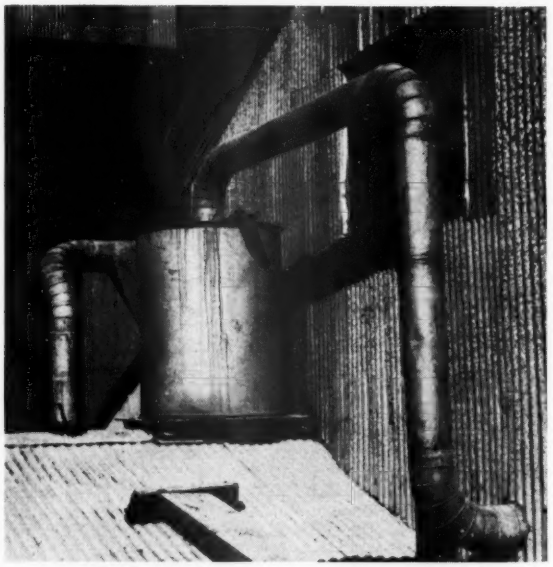
1. Two misting sprays are now installed on the two standard crushers.
2. Misting sprays are enclosed on each of the two pan conveyors leading from the Buchanan jaw crushers.
3. Misting sprays are installed to the rear of the two Ross feeders.
4. One experimental misting spray is installed in front of the head pulley on No. 25 belt, this belt being the one that feeds the surge bins. This spray is experimental in that it is being used to suppress the dust that often is given off from the belt which contains fines left on the surface after passing the tripper.

These water sprays are for the purpose of wetting the surface of the ore at transfer and crushing points. They rely upon the use of a small quantity of water in the form of a mist rather than a water stream that would moisten the ore and cause possible clogging and spillage. Results obtained with the misting sprays are so encouraging that 73 more are being installed throughout the crusher.

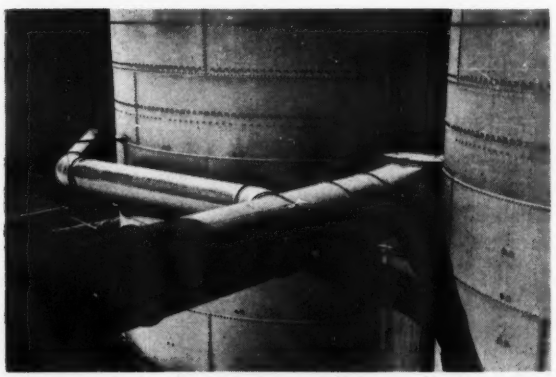
C. Forced Ventilation

1. The main exhaust system operates at present through a Sturtevant Silentvane fan handling 40,000 cubic feet per minute at 1,100 r.p.m. This fan handles dust generated by short-heads, bins and screens and along No. 27 belt. In the near future this fan will be stepped up to around 50,000 c.f.m., and a wet collector is to be installed in front of the fan, the collector being a triple baffle spray tank.

2. An auxiliary fan system is installed to handle blasting at the Buchanan crushers and in the bins. A Clarage fan in a separate building exhausts this dust through a 52-in. duct, handling 34,000 c.f.m. at 654 r.p.m. This fan is intermittent and is turned on before a blast to build up an air stream before the explosion. As a rule it is run at least 10 minutes after the blast, by which time it has cleared the atmosphere.



Cyclone handling dust from a transfer point



Exhausting ducts handling dust from jaw crushers in the No. 2 unit

3. There is in addition a separate exhaust system that is continuous for the Buchanan crushers, this system consisting of two ducts leading from below the jaws through a cyclone to a Sturtevant No. 60 Planovane fan which handles 12,600 c.f.m at 786 r.p.m. The cyclone is to be replaced with a wet collector similar to the one being installed on the main system, only of lower capacity.

4. There are, in addition, three separate exhausting units which handle dust generated at belt transfer points. These systems consist of Sturtevant Rexvane fans handling between 2,500

to 3,000 cubic feet per minute with speeds varying from 2,170 to 2,415 r.p.m. Ducts lead from the belt covers to cyclones, and for convenience the coarse material is returned to the circuits and the balance exhausted. These separate installations are required as the locations are in conveyor galleries beyond the possible range of the main exhausting systems.

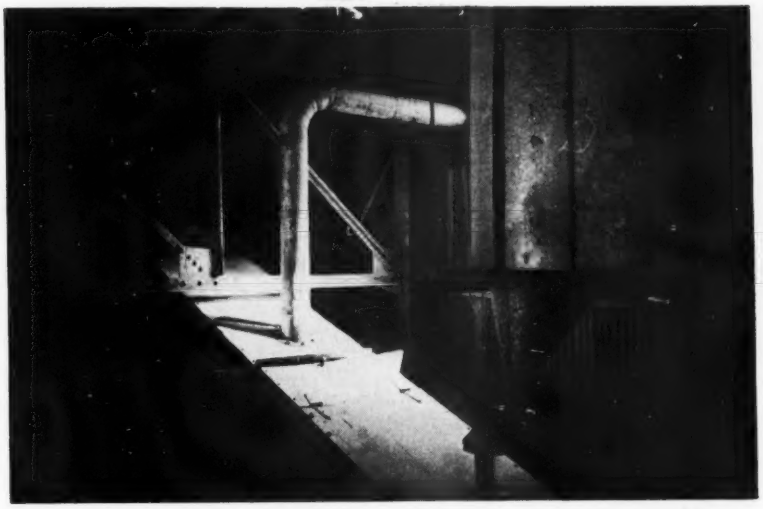
5. To provide fresh air for the building, four fans will be installed on the south wall, each having a capacity of 14,500 c.f.m.

It should be indicated that in no case is air returned to the building after passing through collectors. As regards the triple baffle spray tanks, the water from this can be introduced to the No. 1 Mill unit or disposed of as waste. No decision has been reached in this regard, as these wet scrubbers have not been installed as yet. They will probably be in operation this coming summer.

D. Supplementary Methods

1. Periodically throughout the operating shift, the floors are wet down with hoses to suppress the coarse dust and maintain better atmospheric conditions within the building.

2. Respirators are worn whenever needed. A man is employed whose job is to service these respirators. A worker coming off shift checks his respirator in at a checking station, and new filters and parts are added as needed.



Interior cyclone installation in No. 2 crusher

3. A vacuum cleaner system is being studied at the moment, but so far no decision has been reached as to a vacuum installation.

4. Cleanup is continuous throughout the operation, the dirt and dust cleaned being returned to the circuit through a special hopper located at a point in the circuit where dust is not apt to be generated.

Dust Sampling Program

As is the case with the mine, the crushing unit is under constant observation by the dust engineer. Grab samples are not routine, all sampling being conducted over an 8-hour period. Certain definite stations are selected as standard, and the dust engineer samples these at half-hour intervals throughout the entire shift. In this manner a picture is built up of the operating day.

The theory at Climax is that of eternal vigilance in regard to dust control work, whether at mine or crusher; and the purpose of the dust surveys is to indicate where changes should be made and to spot leaks and flaws in the system. Whenever the dust surveys indicate a hazardous condition at any point, immediate steps are taken to correct same.

Improving Service From Hoist Ropes

By F. L. SPANGLER, M.E.

THE problem of increasing the life of mine hoist ropes resolves itself into one of retarding fatigue action, since the determining factor in discarding mine hoist ropes is the breaks in the rope wires caused by metallic fatigue, rather than wearing of the wires through abrasion.

Fatigue itself is a phenomenon found in every wire rope that is subjected to high alternating stresses. The higher the stress and the more frequently it is altered, the sooner does fatigue make its appearance in the form of broken crown wires in the rope. That's why fatigue is an important factor where ropes operate continuously over sheaves and drums, and why fatigue is especially severe where high bending stresses are introduced into the rope by sheaves of small diameter.

The process by which the rope is manufactured is in itself an influence on fatigue. In ropes whose strands and wires lie dormant—known as "preformed rope"—the absence of locked-up stresses in the wires gives rope high resistance to fatigue. The "state of ease" of the wires in a preformed rope is obtained in the manufacturing operation—that of forming each strand to the final shape it assumes in the rope, prior to closing onto the rope center. On the other hand, non-preformed ropes are more susceptible to fatigue, because the non-preformed wires have within them many pent-up stresses caused by the manufacturing operation of forcing the strands into a shape from which they constantly try to free themselves.

As the wires in a rope increase in size, bending stresses increase; therefore ropes having a few large wires will fatigue more rapidly than those having many small wires. Lang-lay rope resists fatigue better than regular-lay rope because with Lang-lay construction the angle made by the outer wires with the rope axis results in smaller stresses for a given strain.

Another factor which promotes fatigue is vibration or whipping. Vibration imposes extremely rapid changes in stresses in a rope—these stresses being dampened or concentrated at the end of the rope, where it is attached to clips or to a socket. It is here that fatigue breaks often make their first appearance.

Acceleration under load is an important factor in developing fatigue. With the relatively short lift of shallow-shaft mines, acceleration of the cage is rapid, and this introduces high stresses in the rope that are favorable to fatigue. Since the stretch caused by a given load is approximately proportional to the length of the rope, the stresses in the shorter ropes, such as those in shallow-shaft mines, are not relieved to any considerable extent by stretching, and hence these ropes are subjected to unduly high stresses.

Importance of Proper Handling of Hoist Engine

The manner in which the hoisting engine is handled has a marked influence on the fatiguing of hoist ropes. By careful attention to his job, the operator can provide smooth acceleration and eliminate jerky operation, which is very destructive to rope. Also a careful operator can prevent much of the disastrous vibration and whipping that often occurs in hoist operation.

Typical of the service obtained from hoist rope in shallow-shaft mines is the experience of a large midwestern coal company. Data from four of this company's mines, all having shafts between 500 and 600 ft. deep, are given in the accompanying table. These data, all of which are up to date, comprise the tonnage given by five consecutive ropes in both shafts of each mine. Because a few of the figures show a wide variation, averages also are given.

To retard fatigue and gain higher tonnage, this company uses hoist ropes of preformed construction and head sheaves of ample diameter to keep bending stresses low.

All drums are of the stepped-up, grooved type, and vary from approximately 7 to 9 ft. in diameter. Only single ropes are used for haulage purposes, and these are attached to the cage frames by thimbles and clip fastenings. Each rope winds several layers on the drum. According to general practice, the rope is clamped at the drum in such a manner that a considerable length of free end is left inside the drum, thus allowing shortening of the rope caused by cropping at the cage end to be compensated for by drawing out some of the rope at the drum end.

TONNAGE RECORDS OF HAULAGE ROPES IN SHALLOW - SHAFT MINES OF A MIDWESTERN COAL COMPANY

Mine A—1¼-in. 6 x 19 non-preformed rope, with hemp center

Shaft No. 1	Shaft No. 2	Shaft No. 1	Shaft No. 2
183,861	107,361	142,275	134,167
50,298	190,770	158,233	151,462
97,936	131,411	126,520*	143,034*

*Average.

Mine B—1½-in. 6 x 19 preformed rope, with hemp center

Shaft No. 1	Shaft No. 2	Shaft No. 1	Shaft No. 2
236,358	236,358	265,696	215,817
249,681	265,430	249,881	226,694
223,905	185,662	245,104*	225,992*

*Average.

Mine C—1½-in. 6 x 19 preformed rope, with hemp center

Shaft No. 1	Shaft No. 2	Shaft No. 1	Shaft No. 2
241,836	349,862	270,516	207,719
290,496	189,690	272,271	233,960
250,362	227,086	261,096*	241,663*

*Average.

Mine D—1⅛-in. 6 x 19 preformed rope, with hemp center

Shaft No. 1	Shaft No. 2	Shaft No. 1	Shaft No. 2
374,730	248,525	225,000	176,477
280,584	361,991	126,637	350,455
376,350	255,955	276,660*	278,681*

*Average.

In this company's experience, most wire breaks occur within 90 ft. of the cage attachment, and within 10 to 15 ft. of the drum when the cage is resting on the bottom. Breaks also often make their appearance in that section of rope that falls on the step-up on the drum. It is at these points that fatigue action is most severe.

Cropping and Reclamping Cage Ends

When fatigue breaks, occurring in the wires at the cage end, have weakened the rope at this point, this end is cut off and the new end is reeved through the heart, or nipple, and the clips reattached. Cropping at the cage end or taking up at the drum end is also resorted to at frequent intervals when the rope is new, in order to compensate for the constructional stretch that occurs in the early part of rope life.

The number of times that the end of a rope is cropped and reclamped at the cage varies with operating conditions, but in the case of the mine designated as Mine A in the table, which may be accepted as typical, this operation is performed 8 to 10 times during the life of each rope. At Mine C, however, the cage end of every rope is cropped and reclamped 14 to 20 times in the lifetime of the rope, but in this case some of these adjustments are made to take up the stretch, since the type of drum used at this mine does not allow of rope adjustment at this point.

Adjustments at Drum Ends

In addition to adjusting the rope at the drum to compensate for constructional stretch, it is also usual practice to let out the rope at this point frequently in order to shift the part that receives the wear at the step-up on the drum to some other location as well as to shift the location of the cross-over points where each wrap in a layer crosses over a wrap in the lower layer below. Thus, the wear at these points is distributed over a greater length of rope, and the service of the rope is increased. These adjustments at the drum end are made once a week, in the case of Mine B.

While the cropping of damaged rope ends, and frequent shifting of the position of the rope by cropping at the cage end and letting out at the drum, will increase the service obtainable from each foot of rope, the mine operator or superintendent should not overlook other ways of reducing fatigue in wire ropes, such as the use of large-diameter sheaves, maintaining sheave grooves in proper condition, keeping lead angles small, taking advantage of the fatigue-resisting property of preformed rope, and keeping ropes well lubricated with a suitable grade of lubricant.

Prospecting in Newfoundland

Plans of the Newfoundland Geological Survey for the coming season include six prospecting parties to investigate mineral deposits where commercial ore bodies of strategic metals may be found, especially copper and those metals used in ferro-alloys, reports Vice Consul Charles C. Sundell, of St. John's. Special work is to be done on the Green Bay copper areas, where it is hoped that a number of small deposits may be developed sufficiently to warrant the erection of a central mill for the production of copper, sulfur and other products of the complex ore. Two diamond drills will be employed throughout the summer.

An important part of the survey will be to trace the central mineral belt from Green Bay through Buchans to the southwestern coast. There is reason to believe that there is mineralization from LaPoile northeasterly to Notre Dame Bay.

Distant view of the concentrator at Mascot

The M. B. I. Differential Density Process at Mascot

By the METALLURGICAL STAFF
American Zinc, Lead and Smelting Company

THE differential density process now in operation at Mascot, Tenn., property of the American Zinc, Lead & Smelting Company is the result of extensive research work in the development of the sink and float method of mineral beneficiation. The successful treatment at this concentrator of over a million tons of zinc ore has removed the process from the experimental stage and established it as a major development in concentrating practice.

As developed at Mascot, the process consists of the continuous rejection of a large proportion of the mill feed as a barren tailing by passing coarsely ground ore through a cone filled with separating medium of high specific gravity. The Mascot medium is a suspension of galena in water in which the barren gangue floats and the mineralized ore sinks.

The basic principles are the same for the sink and float method as for concentration by jigging or tabling. Preliminary tests were therefore necessary to determine the limits of grain size for optimum results. The presence of fine granular or colloidal particles of material having a lower specific gravity than that of the suspended solid of the medium has three decided disadvantages. First, they lower the specific gravity of the medium because of their own lower specific gravity; second, they lower the specific gravity of the medium or require the addition of make-up solids by introducing excess water through entrainment or occlusion; and third, they alter the physical characteristics of the medium, particularly its viscosity and consequent separating power.

The Differential Density Cone Process being used by the American Zinc Company of Tennessee at its Mascot, Tenn., operations, and by the Eagle-Picher Mining & Smelting Company at its central mill operations in the Picher, Okla., district is now treating at the rate of approximately 3,500,000 to 4,000,000 tons of zinc ore annually. The entire tonnage of both properties is being handled by this process.

The American Zinc, Lead & Smelting Company, 943 Paul Brown Building, St. Louis, Mo., exclusively controls the licensing of this process in the United States, Mexico and Canada for all types of ore and coal.

Mechanics of Separation Simple

The mechanics of the separation are simple. The prepared feed is delivered continuously to a cone filled with the heavy density medium. The lighter tailings float and overflow a weir discharge with a large amount of separating medium. This medium is drained through a vibrating screen and returned to the cone. The drained oversize is washed free of adhering medium on a second vibrating screen. The mineralized particles sink to the bottom of the cone, are elevated with a portion of the heavy density medium by a central airlift, and drained and washed on two screens similarly to the treatment of the tailings.

In 1935 the first test unit was built. The separatory cone was 3 ft. in diameter. Shaker-type screens provided for drainage of the medium from both concentrates and tailings and for the necessary washing. The medium of galena and water was stored in a large cone.

Ore is Lead-Free Sphalerite

The Mascot ore is a lead-free sphalerite, more or less disseminated in a dolomitic gangue rock and accompanied by a small amount of flint and recrystalline rock. A mineralogical analysis is shown in Table I.

TABLE I—MINERALOGICAL ANALYSIS OF MASCOT ORE

	Percent
Calcium Carbonate	48.11
Magnesium Carbonate	35.36
Silica	8.73
Alumina	1.04
Iron as Oxide	1.33
Zinc Sulphide	5.43
Total	100.00

About fifty tests were made on ore varying screen size in amounts from 900 to 23,000 pounds. The results indicated that with the existing milling equipment a feed coarser than ⅛ in. should be used in the treatment of the Mascot ore, the upper limit being dictated by operating considerations of the crushing plant, disposal of sized tailing for sale, etc. With this determined, twelve tests were made using a feed sized between minus 1¼ in. and plus ⅛ in. to determine the capacity of the separatory cone.

The data of two representative tests are given in Table II.

TABLE II—TYPICAL PILOT TESTS ON MASCOT ORE

Test No. 10

Treated 13,095 Pounds of — 1 in. + 3 Mesh Feed
Pounds Per Hour — 2,500

		Dry Solids		Zinc Contents		
		Percent Cone	Percent Mill		Percent Cone	Percent Mill
	Pounds	Feed	Feed	Assay Percent Zn	Feed	Feed
Concentrates	1,587	12.1	9.3	15.15	86.7	47.4
Tails	11,508	87.9	67.6	.32	13.3	7.2
Cone Feed	13,095	100.0	76.9	2.11	100.0	54.6
Fines	3,734		23.1	6.15		45.4
Mill Feed	17,829		100.0	2.97		100.0

Test No. 31

Treated 2,720 Pounds of — 1¼ in. + 3 Mesh Feed
Pounds Per Hour — 2,640

		Dry Solids		Zinc Contents		
		Percent Cone	Percent Mill		Percent Cone	Percent Mill
	Pounds	Feed	Feed	Assay Percent Zn	Feed	Feed
Concentrates	295	10.8	8.0	13.92	85.4	46.6
Tails	2,425	89.2	66.1	.29	14.6	8.0
Cone Feed	2,720	100.0	74.1	1.77	100.0	54.6
Fines	951		25.9	4.21		45.4
Mill Feed	3,671		100.0	2.40		100.0

With the test plant experience as a basis, the next step in the development of the process was the construction of a unit with a 6-ft. diameter separatory cone and the necessary auxiliary equipment. This unit, designed to handle five tons per hour, ultimately treated 75 tons per hour and became a part of the mill circuit. In 1938, after 18 months of operation, it was replaced by a 9-ft. diameter cone which, since February, 1939, has become the major step in gravity concentration and has replaced all jigs for coarse ore treatment.

The use of the 6-foot cone gave the necessary experiences with such operating details as feed preparation, maintenance of the medium, washing of the products, water, power and reagent consumption, but the data obtained are not of particular interest for this paper. They showed the process to be simple and economical and that a decided increase in milling capacity could be attained with a relatively small capital outlay.

To what degree this was possible is shown in the following paragraphs. Table III gives a comparison of some mill data before and after the introduction of the M. B. I. process into the flowsheet.

TABLE III—COMPARISON OF MILL DATA BEFORE AND AFTER INTRODUCTION OF M. B. I. PROCESS TO FLOWSHEET

	Years 1931-1935	March-Dec. 1939
MILL FEED		
Size	5/8 in. Round Hole	1.5 in. Square Hole
Tons Per 24 Hours	1,898	2,703
Assay — Percent Zinc	2.78	3.12
CONCENTRATES		
Jig		
Tons Per 24 Hours	25	47
Assay — Percent Zinc	58.86	58.38
Percent of Total Zinc	28.15	32.50
Flotation		
Tons Per 24 Hours	52	81
Assay — Percent Zinc	61.14	62.65
Percent of Total Zinc	59.68	60.11
TAILINGS		
Coarse		
Tons Per 24 Hours	859	1,542
Assay — Percent Zinc	0.66	0.33
Percent of Total Zinc	10.69	6.08
Flotation		
Tons Per 24 Hours	962	1,033
Assay — Percent Zinc	0.081	0.107
Percent of Total Zinc	1.48	1.131
Total Mill Recovery — Percent	87.83	92.61
Ratio of Concentration	24.65	21.20
POWER CONSUMPTION		
K. W. H. Per Ton Feed	13.38	11.33

The screen analysis in Table IV shows the size of the rejected tailing and the zinc distribution in those sizes. The high zinc assay of the minus ¼-in. portion is due to attrition of sphalerite but represents only 0.7 percent of the total weight and 3.8 percent of the zinc in the tailings.

Flowsheet Summarized

A graphic flowsheet of the ore preparation is shown in Fig. 1. The run of mine ore is fed from the hopper by a Ross chain feeder onto a 48-in. belt conveyor which delivers it to a 30-in. McCulley gyratory crusher. The product is conveyed by a 24-in. belt conveyor to a No. 4 Symons cone crusher in closed circuit with an Allis-Chalmers low head type screen with 1.5-in. square openings. Formerly a set of 20-in. x 54-in. rolls was in the circuit, but at present the ore passes through them without grinding; after sampling, it is conveyed to two low head type Allis-Chalmers screens, equipped with ⅜-in. round-hole punched plate screen. A chain bolted to the plate has been found useful to prevent blinding when the feed is wet (Fig. 2).

The oversize from these screens is

TABLE IV—SCREEN ANALYSIS OF COARSE TAILING

Screen Size	Solids		Zinc			
	Percent Weight	Cum. Percent Weight	Assay Percent Zn	Cum. Assay	Percent Total Zinc	Cum. Percent Total Zn
On 1¼-in. Square Hole	7.2	7.2	.20	.20	4.7	4.7
1⅛-in.	11.1	18.3	.26	.24	9.8	14.5
1-in.	15.1	33.4	.25	.24	12.4	26.9
¾-in.	27.1	60.5	.28	.26	25.4	52.3
⅝-in.	11.8	72.3	.29	.26	11.5	63.8
½-in.	11.6	83.9	.35	.28	13.7	77.5
⅜-in.	10.0	93.9	.39	.29	12.9	90.4
¼-in.	5.4	99.3	.32	.29	5.8	96.2
—¼-in.	.7	100.0	1.67	.30	3.8	100.0

conveyed to the feed storage bin for the differential density unit. The ore from this storage bin is washed in a drag conveyor. From the drag conveyor it passes to two shaking screens for final washing. The spray water used is applied through fish-tail sprays suitably placed. To insure the greatest washing effect, strips of old conveyor belting are bolted to the screen at right angles to the ore flow, causing the rock to tumble and presenting all sides to the water sprays (Fig. 3).

Low Moisture Desirable in Cone Feed

The undersize from these washing screens is deslimed in a small drag classifier, the sands going to the fine grinding circuit. The slimes join the slime overflow from the drag conveyor in a Dorr thickener whose underflow goes to flotation. The overflow is returned to the washing conveyor making a closed circuit for the wash water. The washed oversize is fed to the separatory cone of the differential density unit by a 20-in. conveyor belt, seen at the right in Fig. 4. The slope of this belt is rather steep to allow the feed to drain thoroughly before entering the cone. Moisture content of the feed is approximately 1.7 percent. Low moisture content in the cone feed is desirable to prevent dilution of the top medium in the cone.

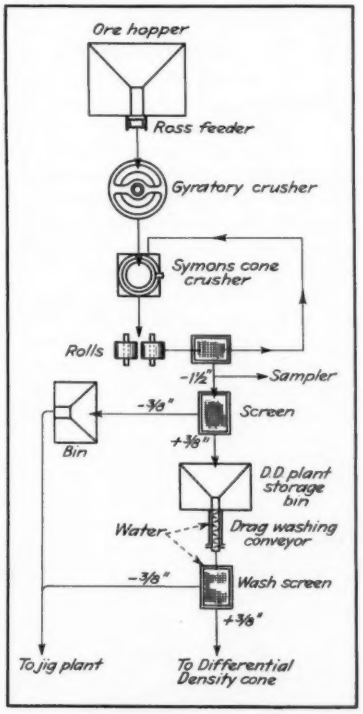


Figure 1. Flowsheet of ore preparation

Cone Construction

The separatory cone is 9 ft. in diameter and 8 ft., 9¾ in. from the bottom plate to the weir overflow. It is made of ½-in. steel plate with welded butt joints to give a smooth inside surface, and is stiffened at the top with a 6-in. x 4-in. x ½-in. angle iron which also forms the lip of the weir overflow. A ring of ¼-in. plate 6-in. high is welded to this angle iron. The bottom of the cone is 15 in. in diameter and is stiffened by a ring of 1-in. plate. The bottom plate is bolted to this ring and contains a pipe nipple 9 in. long for the introduction of air for the airlift. Two shorter nipples are also provided for air agitation in case of a stop-up. A 4-in. gate valve is provided near the bottom for emergency drainage.

A 6-in. diameter pipe extends upward from the bottom of the cone through which the concentrates are elevated and discharged. At the present time this airlift has a submergence of 80 percent, permitting the use of a very small amount of air and obviating the circulation of an excessive amount of medium. A 12-in. pipe is concentric with the airlift and extends to the height of the cone. The exterior pipe allows the medium drained from the screens to be returned to any depth in the cone. Under the method of operation now used at Mascot all the returned medium as well as the make-up medium is added onto the surface of the heavy density mass in the cone. Two triangular-shaped stirring arms are attached to this pipe. The entire assembly is driven at a speed of 4½ R. P. M. by an electric drive mounted on the cone.

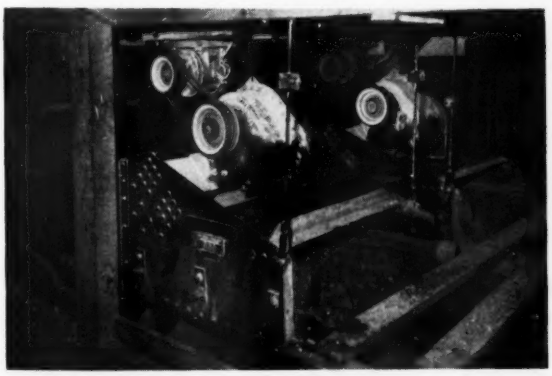


Figure 2. Low head vibrating screens. Chain bolted to screen plate prevents blinding

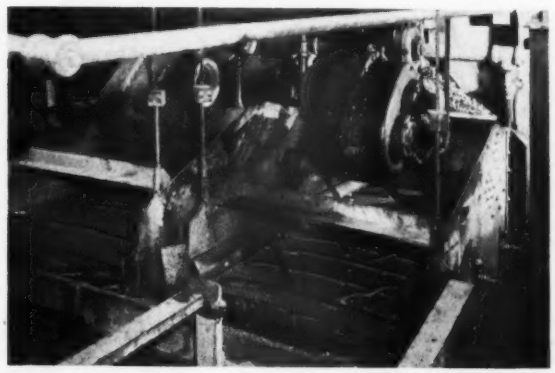


Figure 3. Showing old conveyor belting bolted to screen to insure greatest washing effect

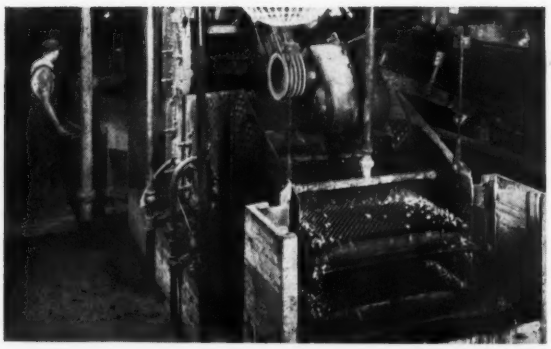


Figure 4. Separatory cone and vibrating screen for concentrates and medium

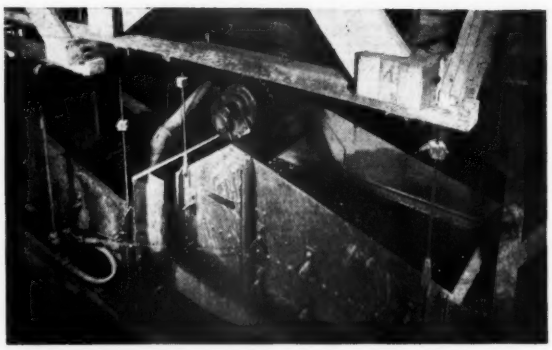


Figure 5. Showing weir overflow from cone, at extreme right

The slowly rotating paddles serve two purposes. They prevent the formation of galena masses on the side of the cone and aid in distributing the feed over the cone surface by rotating the liquid mass at a slow speed but maintaining a quiescent surface.

The weir overflow is 3 ft., 8-in. wide, the material falling onto an apron welded to the side of the cone and flowing onto the tailings drainage screen. It is shown at the extreme right of Fig. 5.

The circulation of galena medium over the weir and up the central (concentrate) airlift amounts to approximately 175 gallons per minute of which the tailings drainage accounts for 80 percent.

The airlift discharges the concentrates and medium to an Allis-Chalmers low head vibrating screen where the greater part of the adhering medium drains off and returns to the cone. The concentrates are then washed on a second screen and are conveyed to the jigging plant for further treatment. The drainage from the Allis-Chalmers screen receiving the weir overflow is collected in a cone also equipped with an airlift. The medium is thickened in this cone, the airlift returning it to the separatory cone, the overflow being pumped to a 20-ft. Dorr thickener.

The tailings are given an intensive washing similar to that for the feed material on Allis-Chalmers screens of the same type. The wash water is combined with that from the concentrates and the overflow from the cone thickener, and goes to the Dorr thickener mentioned above. This thickener serves a double purpose: (1) rejection of fine ore and slime from the medium, and (2) as a storage for the medium. All new galena is added to this thickener. The spigot is pumped to the

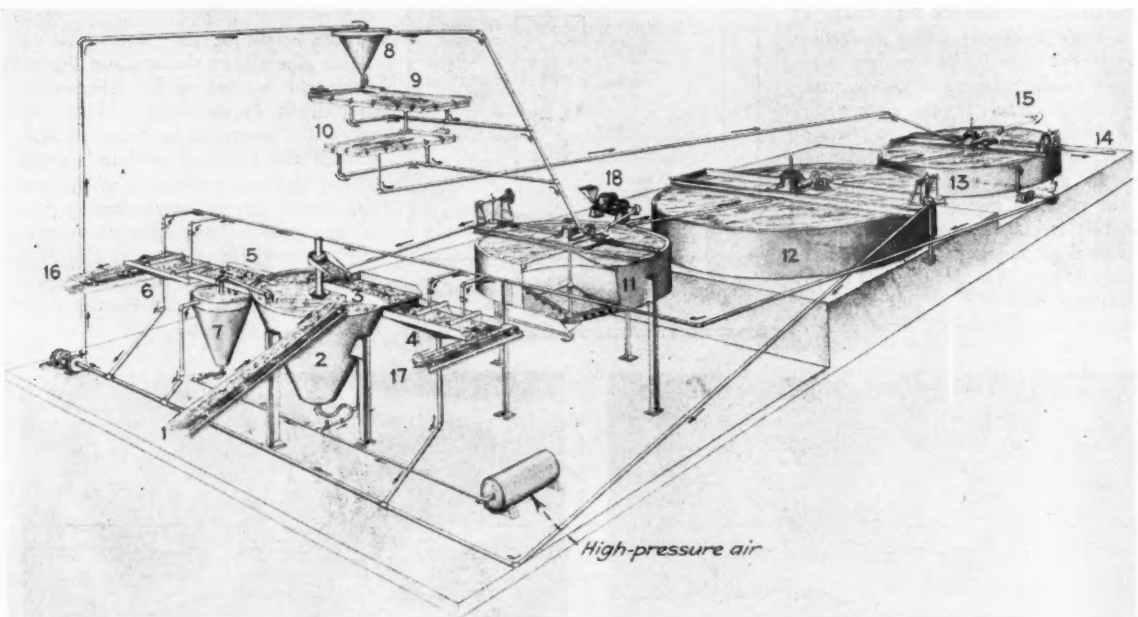


Figure 6. Flowsheet of differential density unit

1. Sized washed feed
2. (D.D.) Differential density cone
3. Concentrate drainage screen
4. Concentrate wash screen
5. Tailing drainage screen
6. Tailing wash screen
7. Tailing drainage air lift
8. Settling cone
9. Coarse lead table
10. Sand removal table
11. Make-up medium
12. Decantation tank
13. Wash water clarification tank
14. Sand and slimes discarded
15. Make-up water
16. Plant tailings
17. Plant concentrates
18. Galena make-up

separatory cone by a Dorr suction pump.

This describes the equipment of the separating process. The equipment for cleaning the medium will be described later. The isometric drawing shown in Fig. 6 gives a flowsheet of the D. D. unit, and Fig. 7 shows the separation.

Cone Operation Very Simple

The operation of the unit is extremely simple. The prepared feed drops continuously from the conveyor at (1), Fig. 7, onto the surface of the fluid mass which has a slow rotary motion imparted to it by the paddles (4). The slow turning of the mass permits the even distribution of the feed over the tranquil surface of the heavy density medium and assists in the maintenance of the differential density in the cone. The tailings, which have a specific gravity of 2.80, overflow the weir onto drainage screen (8), pass to the washing screen (12) and leave the plant by conveyor (17). The concentrates which have a specific gravity of about 3.0 are discharged by the airlift to the drainage screen (5), are washed on screen (7) and leave the unit.

The entire separation depends upon the physical characteristics of the medium which at Mascot is a suspension of galena in water. The particle size is important to maintain fluidity. For Mascot ore, experience indicates that a medium with the screen analysis shown in Table V is most desirable.

TABLE V—SCREEN ANALYSIS OF GALENA IN SEPARATION MEDIUM

Screen Size		Percent Weight
On 100	Mesh	4.6
150	"	5.2
200	"	8.8
325	"	16.4
Through 325	"	65.0
Total		100.0

The fluidity of the medium depends not only on the particle size but also on the absence of interfering colloids. Their presence makes the medium more viscous and decreases the sharpness of the separation and the tonnage that can be treated in unit time. It is necessary to secure their dispersion by a suitable agent, the one used at Mascot being tri-sodium phosphate. It is used in an amount to keep the water in the system at a pH of 9.5.

Effective Cleaning System for Medium

The presence of material having a lower specific gravity than galena either decreases the specific gravity of the medium or, if the gravity is maintained at the requisite figure, increases its viscosity. To eliminate such solids requires a cleaning system which is operated continuously.

The function of this system is to maintain the medium at its optimum density by rejecting colloidal ore and galena particles and by rejecting diluting water which enters the circuit entrained in the ore and introduced by washing the medium from the products. Fig. 6 shows the method used at Mascot during the year 1939.

The wash water from the screens (4) and (6) is combined with the overflow from the storage cone (7). It is pumped to a settling cone (8) whose overflow goes to the Dorr thick-

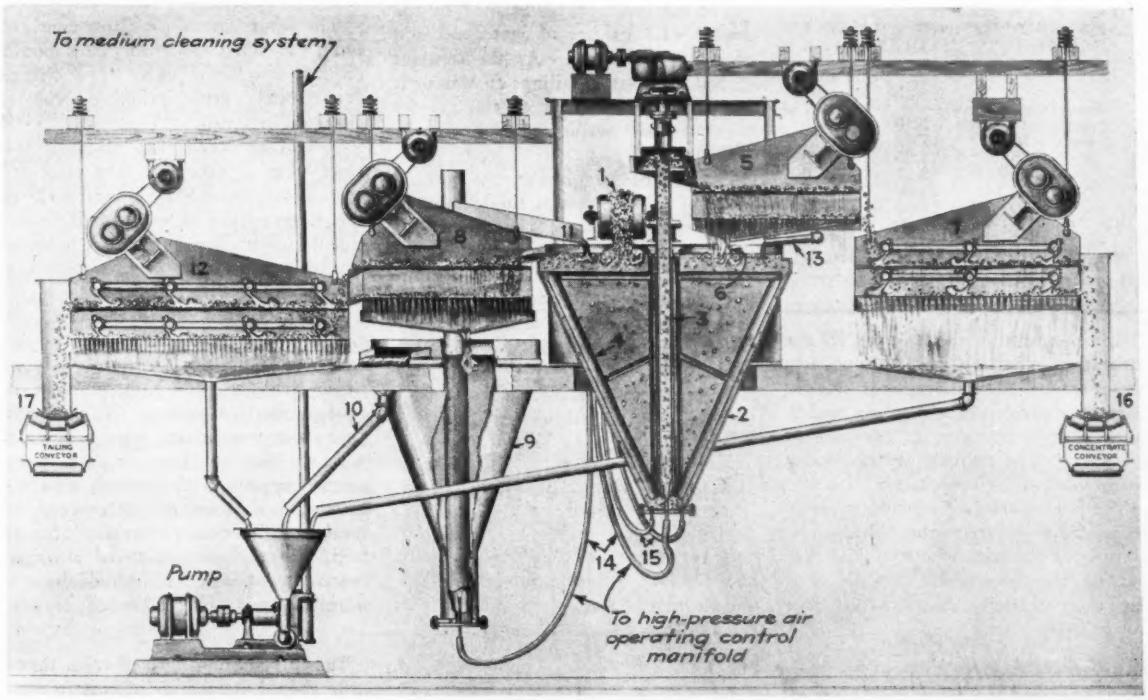


Figure 7. Diagram showing details of separation process

1. Sized washed feed
2. (D.D.) Differential density cone
3. Concentrate air lift
4. Agitator rake
5. Concentrate drainage screen
6. Return medium, concentrate drainage
7. Concentrate wash screen
8. Tailing drainage screen
9. Tailing drainage air lift
10. Tailing drainage overflow
11. Return medium, tailing drainage
12. Tailing wash screen
13. Medium make-up
14. Air to air lifts
15. Air for auxiliary agitation
16. Washed drained concentrates
17. Washed drained tailings

ener (11) and whose underflow is treated on a standard size Deister-Overstrom table for removal of the coarse galena, which, together with the slimes, is returned to the Dorr thickener. The non-metallics from this table are cleaned on a half-sized Wilfley table (10), the sands going to the clarification tank (13) and the overflow rejoining the metallics in the Dorr thickener (11). The underflow from this thickener is pumped continuously to the separatory cone to maintain the medium at its required density.

The new galena which is added to make up for the mechanical losses and the colloidal reject is fed to this thickener together with the underflow from the decantation tank (12).

The supply of new galena is added once per 8-hour shift. Galena jig concentrates are ground through a 3 mm. round-hole screen in a small ball mill as needed. The grinding is conducted so as to make a minimum amount of minus 100 mesh galena in the product. Table VI gives a representative screen analysis of the new galena as added to the medium tank.

TABLE VI—REPRESENTATIVE ANALYSIS OF NEW GALENA AS ADDED TO MEDIUM TANK

		Weight	Cumulative Percent
On	10 Mesh	2.15	2.15
	20 "	7.59	9.74
	35 "	11.85	21.59
	65 "	19.17	40.76
	100 "	24.39	65.15
	150 "	16.62	81.77
	200 "	9.70	91.47
	325 "	5.66	97.13
Through	325 "	2.87	100.00
		100.00	

The density of the medium in the separatory cone increases constantly downward. This increase is due in part to settlement of the galena, and in part to the converging of the cone at its apex. The density at the top is maintained at 2.80 specific gravity and at the bottom at 2.95 specific gravity. It is believed that this differential eliminates particles whose gravity lies between the above limits, thus preventing their accumulation in the cone. An Adams density indicator registers the gravity at all times so that the operator may change the addition of make-up medium to keep the cone density at the required figure. Hand sampling hourly keeps a check on the indicator. The Adams indicator can be connected with the medium supply to make the addition of new medium automatic.

The overflow from the Dorr thickener (11) goes to the Dorr thickener (12) used to decant the water and the colloidal solids from usable galena. The overflow from this tank passes to the clarification tank (13) from which the clear overflow returns to the system for spray water. The thickened solids, containing about 32.5 percent lead, are sold for their lead content. All make-up water is added to the system in the clarification tank.

The water demands for the differential density unit are slight. The water used for washing off entrained medium is recoverable, as the galena carried off by it must be recovered. The only loss is water entrained in the products and floor spillage, both of which are nominal. Satisfactory washing of the products is obtained by the use of 43.5 gallons of water per ton of material washed. As the tonnage of concentrates to tailings at Mascot is in the ratio of 1 to 6, the greater part of this water is used on the tailings.

As will be seen below, the cost of medium is the greatest single item in the operating cost of the differential density process at Mascot. The installation for maintaining the medium in proper physical condition is also designed to recover as much galena as possible because of its cost. Such medium as adheres to the discarded tailings is lost. A special test to determine the magnitude of this loss showed the following:

Medium Loss Only 14 Lb. per Ton Mill Feed

Shift samples of the tailings were screened on a 65-mesh screen and the undersize was assayed for load. The undersize was .09 percent of the total weight and assayed 9.21 percent lead. Calculating this to galena with a lead content of 80 percent, a loss of .213 lbs. of galena per ton of cone tailings or of .14 lbs. per ton of mill feed is arrived at. The remainder of the galena loss can be attributed to spillage and rejection of colloidal galena with the colloidal gangue material. Over a two-year period galena recovered in the rejected slimes was sufficient to reduce by half the cost of new galena added.

Direct operating costs for the Mascot unit, based on experience to date, are itemized in Table VII.

TABLE VII. OPERATING COSTS FOR DIFFERENTIAL DENSITY UNIT

	Cents Per Ton Mill Feed
Labor	1.25
Power	.8
New galena added	6.0
Repairs	1.0
Miscellaneous	2.0
Total	11.05
Credit for galena recovered from slimes	3.00
Net operating costs	8.05

The labor cost is for three men per shift. A newly designed plant should require only two men. No charge for royalty, depreciation, or capital charge is included.

It will be noted that galena is the chief item of expense. The most recent figures from Mascot indicate that the consumption of galena will be decidedly lower than shown, but it seems advisable to use actual figures covering a longer period of time.

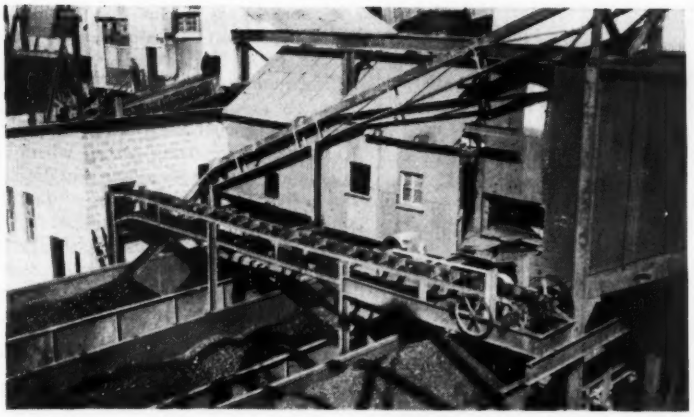
The economic advantages for the entire Mascot concentrator lie in the treatment of more ore than was possible with the mill equipment as it existed, the treatment of this ore with four less men than were necessary with the old flow-sheet, an increase of over 4 percent in the overall zinc recovery, a decrease of 15 percent in total power consumed per ton of mill feed, and the production of a larger tonnage of coarse tailing which is a salable and valuable by-product.

Effect of Acid Mine Waters on Various Cements

Information of interest in connection with the use of cements for concrete structures in mines has been obtained as the result of tests on the effect of acid mine waters on various cements, conducted by the Bureau of Mines, United States Department of the Interior. The results of these tests are presented in R. I. 3487, by R. D. Leitch and J. G. Calverley, recently released by the Bureau.

Although, due to certain limitations, the tests were not comprehensive, they indicate that up to a certain point the use of acid mine water for mixing gives greater tensile strength to some cements than does the use of water of the quality recommended by most cement manufacturers.

The information derived from these tests should also be of interest in connection with the use of cements for highway bridges and culverts and for many other structures in places where waters of the generally recommended quality are not available for mixing, and especially where the construction must withstand contact with acid mine waters.



Diaphragm jig building made of coke breeze blocks at left. First car at left shows washed 1½ in. x 1 in. chestnut being loaded, middle car contains 1 in. x ½ in. washed stoker pea, while car on right is being loaded with unwashed ½ in. slack

CLEANING DAWSON COAL

● ***Use of Hydro-Separator Combined With Diaphragm Jig by Stag Canon Branch of Phelps Dodge Corporation Has Proved of Inestimable Help in Marketing Their Product***

By W. G. MOORE
General Sales Agent
Stag Canon Branch
Phelps-Dodge Corp.

PHELPS DODGE CORPORATION (Stag Canon Branch) conducts soft coal mining operations at Dawson, Colfax County, N. Mex., located on the Southern Pacific Railroad. The coal is sold by a subsidiary company, the Dawson Fuel Sales Company. Production is about one-quarter million tons per year of high grade, long flame, general purpose bituminous coal.

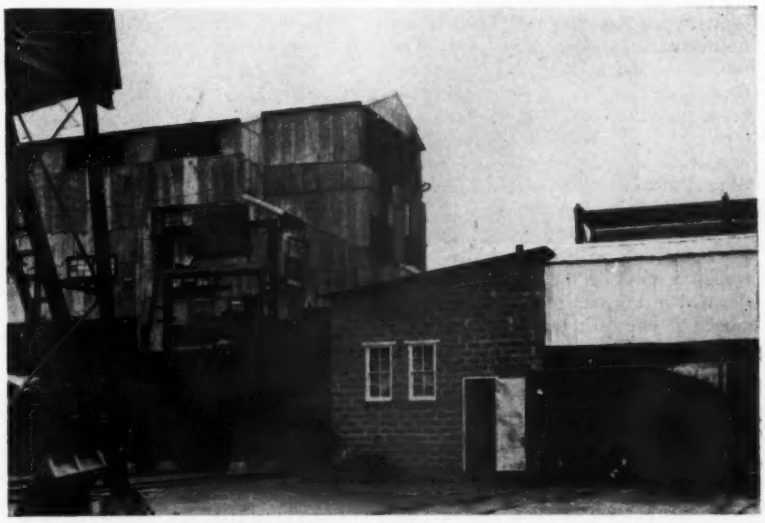
The production comes from one mine which is equipped with modern coal mining machines and an efficient haulage system. Every precaution is taken for the safety of the workmen, including such features as a thorough system of rock dusting and adequate ventilation and sprinkling of the coal to allay dust in the mine.

Dawson is an attractive coal town, with fine schools, an opera house, gymnasium, an outdoor swimming pool, a golf course, and other recreational buildings and playgrounds, as well as one of the largest mercantile stores in the State.

The corporation has been a pioneer in the adoption of methods and devices for improving the preparation of coal, and in this connection have installed a twin Menzies Hydro-Separator and a Jeffrey Diaphragm Jig to clean approximately 30 percent of the production which is largely marketed to retail coal dealers. The cleaning process reduces the ash content by approximately 6 percent.

Hydro-Separator

The raw coal is unloaded at the main tipple by a rotary car dump into a small hopper where it is fed onto a two deck shaker screen 81¼ inches wide, 6-in. screens top deck and 1 in. screens bottom deck. At the bottom of the 21-ft. shaker screen the 6 x 1-in. coal is conveyed to the rescreen and washery plant where coal is first rescreened on a shaker screen 21 feet long and 81¼ inches wide with 3-in. top size, and on the bottom deck 1½-in. screens. The 6 x 3-in. coal is discharged into the grate side of the twin hydro while the



Another view of small building housing the jig, with main tipple at left

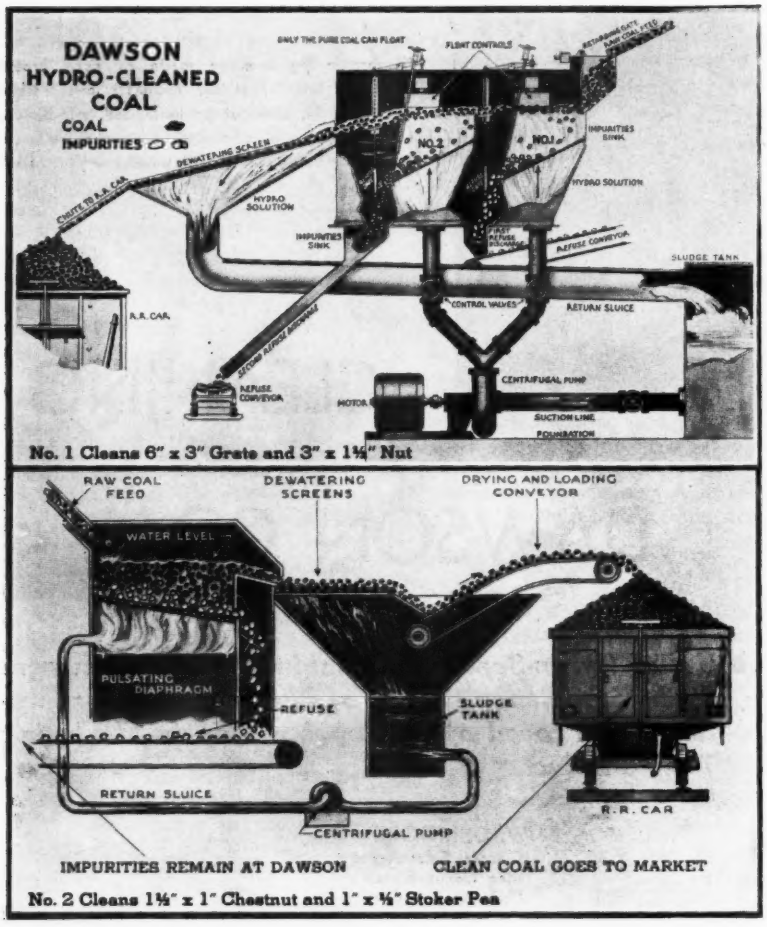


Fig. 1 (Top). Diagrammatic view of hydro-separator. Fig. 2 (Bottom). Section showing action of diaphragm jig

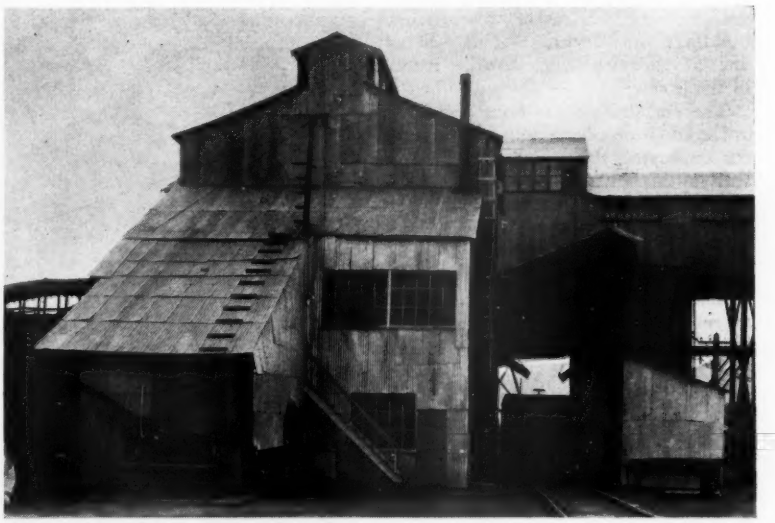
3 x 1½-in. coal is discharged into the nut side of the twin hydro. Each twin hydro has two cells, which are numbered 1 and 2 in Fig. 1. The No. 1 cell being used to remove the rock and the No. 2 to remove the bone. As the sized coal is discharged into cell 2 of the Hydro-Separator it is met by the hydro solution which floats the coal. The heavy impurities sink to the bottom of the cell and are taken away through the bottom by means of an automatically controlled gate—the impurities are then elevated in buckets to a conveyor and moved to the rock tank.

The coal floats from Cell 1 for a secondary refining in Cell 2, in practically the same manner as in Cell 1, except this time the controls are so regulated that even the light impurities (bone) sink and are taken away through the bottom of the cell. This bone is then elevated by buckets to a conveyor where it is moved to the bone tank. This bone or middlings product is shipped to the power plant at Dawson where it is crushed and used as powdered fuel. It analyzes from 25 to 30 percent ash.

The clean coal floats from Cell 2 to the dewatering shaker screen where it is sprayed with fresh water; the liquid is then taken out and returned to the sludge tank while the clean coal moves to the railroad cars, either box or gondola equipment. The dewatering screen on the grate hydro is 84 inches long and 47 inches wide, composed of 44 inches of flanged 1-in. lip screen and 40 inches of flanged 1½-in. lip screens. The dewatering screen on the nut hydro is 70 inches long and 47 inches wide, being composed of 30 inches of 1-in. flanged lip screen and 40 inches of 1½-in. flanged lip screen.

The coal that goes to the sludge tank is recovered and loaded with the smaller sizes of coal. Each cell of the grate hydro is supplied with water by a separate 6-in. centrifugal pump that pumps directly from the sludge tank. Make-up water is provided in sufficient quantity by the sprays already mentioned. The nut side of the hydro is supplied with water by a 10-in. centrifugal pump. The discharge pipe is formed into a "Y" and each branch is equipped with a control valve that regulates water to each cell.

The coal is of hard structure and absorbs little moisture in washing; therefore, no further drying is necessary after dewatering. As shipped the washed coal contains 1½ to 2 percent moisture.



Rescreening plant and hydro-separator building. The 3 in. x 1½ in. washed nut is loaded on track at right, while the washed 6 in. x 3 in. grate coal loads on track at extreme left

In 1939 the Hydro-Separator handled 52,148 tons, as follows:

6" x 3" Grate	20,178.05 tons	38.69%
3" x 1½" Nut	25,015.80 tons	47.97%
Bone	3,874.70 tons	7.43%
Rock	3,079.50 tons	5.91%
	52,148.05 tons	100.00%

The following is a sink and float test on the rock from the Hydro-Separator:

	6" x 3" Grate rock	3" x 1½" Nut rock
Float 1.40	5.50%	4.00%
Float 1.50	14.00%	1.50%
Float 1.60	7.00%	6.00%
Float 1.70	11.00%	10.00%
Float 1.80	5.00%	7.00%
Sink 1.80	57.50%	71.50%
	100.00%	100.00%

The capacity of the Hydro-Separator is 60 tons per hour of each size, grate and nut.

Diaphragm Jig

From the rescreen plant the coal through the lower 1½-in. screens is taken by a conveyor to another building where it is discharged onto a shaking screen with 1-in. top and on the bottom deck ½-in. screens. The coal through the ½-in. bottom screen is not washed, but the 1½ x ½-in. coal passes from the shaker screen to the Diaphragm Jig. There is only one cell in the jig and only one waste product is taken out—the rock and bone above 1.55 specific gravity. The waste is discharged into a flight conveyor and carried to a rock tank from which it is loaded by gravity to trucks or railroad cars (Fig. 2).

The jig discharges the coal onto a two-deck shaker screen mounted on ash boards. The top deck is 20 feet long and 48 inches wide and has 1-in. round screens, while the lower deck is 15 feet long and 4 feet wide and has a ½ x ⅛-in. mesh screen. The coal is dewatered and then sprayed with fresh water before the shaker discharges it into a flight conveyor that loads directly into open top cars. No other drying is necessary. The waste from the jig on a specific gravity test will run approximately:

Float 1.40	.30%
Float 1.50	.25%
Float 1.60	2.00%
Float 1.70	10.05%
Float 1.80	16.05%
Float 1.80	71.35%
	100.00%

The jig is supplied with water from a sludge tank by a 6-in. centrifugal pump. Make-up water is provided by the sprays.

In 1939 the Diaphragm Jig handled 10,598 tons as follows:

1½" x 1" Chestnut	8,763.75	82.69%
1" x ½ Stoker pea	1,282.50	12.10%
Rock	552.00	5.21%
	10,598.25	100.00%

The capacity of the jig is 50 tons per hour.

There is some loss as the sludge from the washing and screening is wasted, but the loss from this source is very slight.

The Hydro-Separator was installed in September 1933 and the Diaphragm Jig in February 1938; their installation has been of inestimable help in marketing Dawson coal.

COAL and SECURITY*

By HON. LOUIS JOHNSON

Assistant Secretary of War

BEHIND Germany's blitzkrieg against the armed forces of her adversaries is a definite plan to isolate, if necessary, to destroy, but preferably to seize the industrial facilities of her enemies. In Czechoslovakia it was the Skoda works that she desired; in Poland, it was the so-called "industrial triangle" that she wanted. In Holland, a primary objective was its factories. In Belgium and northern France, it was the coal and iron deposits that she especially coveted. In each case, the capture or the destruction of the industrial areas hastened success on the military front.

If the soldier is the brain of modern war, industry has become its brawn. Today, the productive capacity of continental Europe is entirely at the disposal of Germany. A totalitarian regime backed up by this industrial might, to say nothing of the possibilities of other accretions as a result of future victories, makes Germany the most powerful military machine in all history.

The next objective of the Nazi regime apparently is the British Islands. Its final destination? Who knows? Whatever itinerary it has planned it must not include the Western Hemisphere. Neither by hostile invasion nor by peaceful infiltration must it be allowed to penetrate this continent. The duty to keep America free of its dire influences, humanity squarely has put up to us. We have men, potential soldiers whose equal for innate intelligence and skill even Germany could hardly find. We have machines, potential munitions plants whose match for precision and production even the mighty Nazi totalitarian regime could hardly develop. But note I said "potential"—"potential soldiers"—"potential munitions plants"—and what we need are actual soldiers today and actual plants today.

It takes time to get these sinews of battle, and time is our greatest need. Yesterday, last week, last month, last year, we had time. We did not make full use of it. It is gone, and there is no use trying to account for it now.

* Presented before the 26th Fuel Conference, Appalachian Coals, Inc., Washington, D. C.

We can and must exert, however, every effort to make up for lost time, the time we had to convert existing facilities from peacetime pursuits to the production of armament; the time to erect and develop new factories; the time to train labor and management in the art of munitions manufacture; the time to convert money into arms and equipment. We may not be able to conquer time completely, but if our entire nation puts its shoulder to the wheel, we can hand it some mighty licks. We can yet lift ourselves bodily from the quicksands of military impotency and gain the firm ground of adequate national defense.

In our hour of need, American industry must come to our assistance, not only as it did a generation ago, but with even greater speed and efficiency. Today there is no munitions industry such as we had on April 6, 1917, as a result of extensive orders from the Allies; and even then it took a year to go into high gear. Today, no comparable armament plants exist in the United States, and the time element is even more acute. In these days of week-end blitzkriegen, a year has become a decade; and the corresponding responsibility upon industry even more serious.

Heavy Responsibility of Coal Industry

In the hands of the coal industry of America rests a large part of this responsibility. You, perhaps, hold the destiny of civilization. Yesterday, this statement may have seemed fantastic, but today I feel sure that all of you realize that my remark is neither facetious nor in any sense an exaggeration. Coal is indispensable to industry. Industry is indispensable to munitions. Munitions are indispensable to victory in battle. Coal, indeed, may become the arbiter in America's preparedness program. With the coal industry of America, therefore, primarily rests the future of this country, and with it the preservation of world civilization.

What does civilization demand of America today? Briefly, to be strong, to save it, if need be, from its enemies. To be strong, America must at the very minimum acquire without delay a force adequate to defend the Western Hemisphere on land, on sea, and in the air. It must be prepared to prevent the establishment of bases in any of the American republics by an aggressor nation from Europe, from Asia, or from either or both directions. It must be able to concentrate men, properly equipped with the latest and most modern weapons and thoroughly trained in their use, at such points and in such numbers as will frustrate all marauders. It must be prepared to police our contiguous waters against modern pirates. It must insulate this hemisphere from Greenland to the Argentine; from Alaska to Chile, against force rampant. To this objective, our country is now fully committed.

To accomplish this end, our program must include not only the raising, organizing and training of our manpower, but also the furnishing of these forces with adequate supplies and equipment. Our governmental plants, arsenals and depots, are wholly inadequate for this purpose. They were designed basically for experimental purposes rather than for the mass production of munitions. We are equipping them with the best of modern machinery and expanding their operations to maximum capacity, but we cannot hope to obtain more than 10 percent of our defense requirements from this source.

For the great majority of our indispensable munitions, including such items as steel, aluminum, radios, fire control instruments, airplanes, machine guns, ammunition, shovels, trucks, tents, medical supplies and some seventy thousand other items, we must have recourse to American industry at large. Contracts are being placed with all possible dispatch and within a few weeks the wheels of hundreds of manufacturing plants all over this country will be turning toward a stronger America.

Thousands of other factories have been surveyed by the War and Navy Departments. Their owners and their managers know what the nation will expect of them in case the emergency becomes more acute. All of them appreciate, as does the War Department, that their ability to produce the required munitions within the necessary time in turn will depend in large measure upon the availability of coal.

During the last World War coal became a major factor in the struggle. With the aid of their own mines and those within the occupied territory of Belgium and northern France, the Central Powers were able to maintain their munitions front for more than four years against an apparently impossible assembly of industrial strength. By furnishing coal freely to the neutral nations that supported her war efforts, and by curtailing the supply to those who favored Germany, Great Britain made use of her coal as a measure short of war to achieve her ends. Truly it became black gold, and far more potent than the yellow metal.

During the past year we again have noted that coal plays a vital role in the fate of nations. Germany made positive use of it to support an industrial war effort on a scale never before conceived by man. England vainly tried to use it in the negative manner, in the style of 1914-18. She was still fighting the present war in terms of the last. She was placing reliance on the passive measures of denying coal and other materials to the enemy and to neutrals as a means of warfare. Today, France is on her knees. England has her back to the wall.

To us, the lesson should be obvious. It transcends all other developments of the past ten months. The enormous coal resources of this country must be capable of conversion promptly into sinews of war. Procrastination and delay must be sidetracked and our munitions program be given a clear track ahead.

Should Profit from Errors of 1917-18

That we may profit by our own errors of a generation ago, as well as by those of the Allies today, let us briefly examine our score in the last World War.

Most of us recall all too vividly the heatless and lightless nights of 1917-18. Think of it! The greatest coal deposits in the world beneath our hills and the spectre of famine throughout the land! Unlike Germany, we had no storage of national resources. Unlike England, we did not lack labor to remove it from the earth. Yet we found it most difficult to keep our wheels turning and our people warm during those critical months.

The difficulty lay, not in production, but in distribution. The flow from the mine continued steady, but transportation could not be found to move it to the consumer. Our railroads became glutted with the precious mineral. Our industrial wheels locked, slowed, and all but stopped. The situation became so serious that the operations of some industries were suspended by government order so that the flow of coal to essential points might be expedited.

In 1917 America was unprepared on its industrial front. We were without plans of any kind to meet the problems arising from fuel and transportation. Once the war was upon us, means necessarily had to be improvised in the midst of ever increasing demands. Existing plants were

expanded, new facilities were erected and thousands of new wheels began to turn.

New wheels meant more transportation. More transportation meant more rolling stock, more terminal facilities and more coal.

With increased demand, prices began to rise. Coal tripled in value in six months. Disastrous competition existed among the Allies, between these co-belligerents and our own government, among the many procurement agencies of our armed services and throughout industry itself. The speculator had a field day.

Finally the unprecedented severity of the winter of 1917-18 created an additional demand for coal and blocked transportation to a degree never before encountered in our history.

We met the emergency by makeshift methods. We had time to blunder through. No one here tonight believes that we ever again will be accorded such an opportunity to learn by trial and error.

I assure you that we have learned not only from our experience in the last war but from the current examples in Europe. The confused efforts of 1917 will not be repeated. Our industrial mobilization program is up-to-date, and has been subjected to scrutiny and corrective suggestions from all walks of our national life. We are confident that our plans are both practical and adequate.

Cooperation Between Armed Services and Industry

Not the least benefit derived from these mutual studies has been the promotion of understanding between the armed services and industry. A generation ago the War Department and the manufacturer had scarcely a speaking acquaintance. Today, each fully appreciates the problems of the other. With the best of cooperation they are making a united effort to promote prompt achievement of national security.

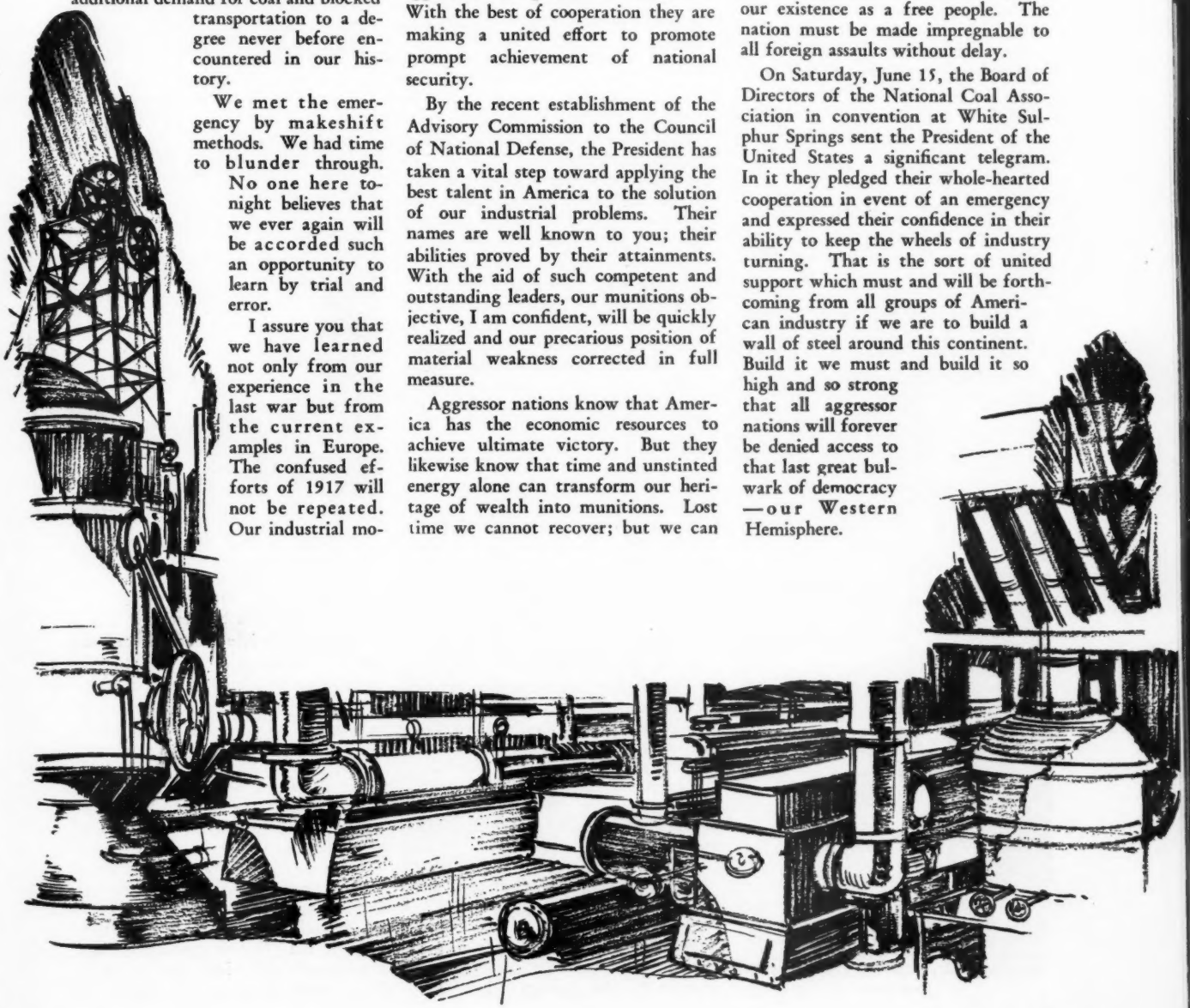
By the recent establishment of the Advisory Commission to the Council of National Defense, the President has taken a vital step toward applying the best talent in America to the solution of our industrial problems. Their names are well known to you; their abilities proved by their attainments. With the aid of such competent and outstanding leaders, our munitions objective, I am confident, will be quickly realized and our precarious position of material weakness corrected in full measure.

Aggressor nations know that America has the economic resources to achieve ultimate victory. But they likewise know that time and unstinted energy alone can transform our heritage of wealth into munitions. Lost time we cannot recover; but we can make it up in part by increased and concentrated effort. With the advice and assistance of the Advisory Commission, I feel certain that the necessary impetus will be forthcoming and that we will overwhelmingly defeat the time element.

There may be some among you who still hope, rather than believe, that "it can't happen here." I sincerely, and we all sincerely, hope and pray that it won't happen here. But I believe that we are all agreed that it might happen here.

We must not gamble away our national destiny nor the destiny of civilization on mere conjecture. There is, at the very least, a definite threat to our existence as a free people. The nation must be made impregnable to all foreign assaults without delay.

On Saturday, June 15, the Board of Directors of the National Coal Association in convention at White Sulphur Springs sent the President of the United States a significant telegram. In it they pledged their whole-hearted cooperation in event of an emergency and expressed their confidence in their ability to keep the wheels of industry turning. That is the sort of united support which must and will be forthcoming from all groups of American industry if we are to build a wall of steel around this continent. Build it we must and build it so high and so strong that all aggressor nations will forever be denied access to that last great bulwark of democracy —our Western Hemisphere.



Construction of Portable Electrical Overhead Systems

● ***Several Ingenious Methods of Affording Easily Movable Trolley Systems for Stripping and Dumping Operations***

By L. W. BIRCH

Transportation Engineer
Ohio Brass Company

IN COAL and ore stripping and dumping operations it frequently becomes necessary to take cognizance of the limitations placed on tonnage velocity, haulage speed, gradient and weather conditions by diesel, gasoline and rubber-tired haulage. By substituting an electrically-powered rail transportation system, these limitations are minimized. An almost unlimited, instantaneous source of power is always available. This source of power performs at peak efficiency under any weather condition, at high speeds, under condition of load or gradient, and at a moment's notice.

There is no trolley or contact wire problem raised where a fixed haul is taken into consideration. But when dumping and stripping operations require tracks to be moved at fairly frequent intervals, it is necessary to have a convenient and rapid method of moving the overhead source of power simultaneously with the truck.

Fig. 1. Loading ore cars at a western property. Note how the offset trolley wire affords ample clearance for the shovel bucket. The steel overhead tower is portable and is moved with the track as mining progresses

There are several approved ways of accomplishing this end. Two of these methods, both well-proved by years of operation, will be described subsequently. The first method was first used at a large western property, the second at a Canadian operation.

At the western property we find a situation where heavy locomotives were used to haul ore trains from benches to yards. A 750-volt contact wire was used throughout the system. In the classification yards a catenary system employing the usual messenger and contact wire was employed. This was advantageous because of the wide pole spacing required. On the benches and switching tracks, however, direct suspension was used.

On the waste dumps considerable settling takes place from day to day, and, to preserve the alignment of the contact wire, the supporting structures had to be attached to extended ties. On these sections, as well as on the benches where ore is loaded into cars, an offset contact wire was required for the purpose of clearing the electric shovel booms, as shown in Fig. 1. Special side arm collectors, installed on each side of the locomotives, were required for current collection, the length of the collector being such as to permit the contact wire to be offset 10 feet from the center of the track.

Self-Supporting Pole Cast in Concrete Block

On the benches two types of supporting structures are used for the support of the contact wire. One type consists of a tubular-steel structure to which is attached a standard tee-bar bracket arm, the upright column being cast into a heavy block of concrete that makes the pole self-supporting (see Fig. 2). This block of concrete has a heavy eyebolt cast in the front. When it is necessary to move the track toward the cut, the various supporting structures can be pulled toward the track by attaching chain falls or a line from a winch to the eyebolts. Sections requiring a 5,000-volt supply line to the electric shovels employ a structural steel tower built to carry both the supply line and the 750-volt contact wire for the locomotives as indicated in Fig. 3. The structural tower is weighted at

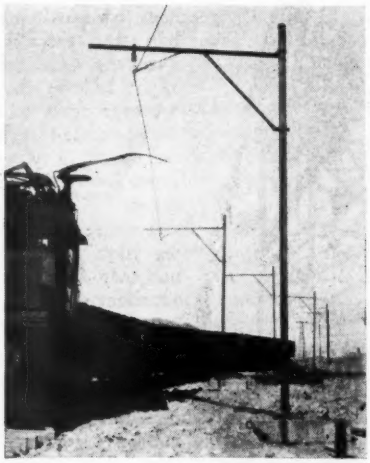


Fig. 2. Tubular steel trolley support cast into mobile block of concrete, making unit easily movable

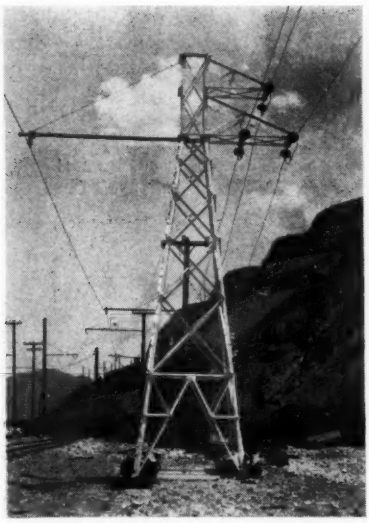


Fig. 3. Closeup of portable steel tower used for overhead support

the bottom with rock and is moved with the track in a manner similar to that devised for the tubular structure.

In moving the portable structures, the entire line cannot be moved at one time; consequently, increased tension and slack develop between structures. A type of trolley support, shown in Fig. 4, permits movement of the line without lowering the contact wire.

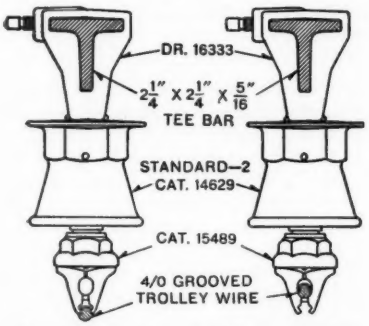


Fig. 4. End views of trolley supporting and insulating devices used on several stripping operations

Normally, the trolley clamp grips the contact wire in the groove. When the portable structures are to be moved, a few turns of the nut of the trolley clamp, as shown to the left in the illustration, will open the jaws of the clamp and permit the contact wire to be pushed into the recess above. This recess has a diameter considerably greater than that of the contact wire. The clamp is then tightened slightly and the wire held loosely in the enlarged recess. When the portable poles are moved, the contact wire is free to slide in the direction of the line; thus excessive tension or slack in the wire, permitting it to drop to the ground, is avoided.

This type of support does not require steadying, and, with a rigid suspension of contact wire through the trolley wire clamp and hanger, a pull-off is not necessary.

Within two years after this electrification system had been installed at this western property, savings from electric operation had absorbed the initial cost of the electrification.

Poles Mounted on Wheeled Trucks

At the Canadian property the same essential problem was brought up in connection with the electrification of a slag dump. In electrifying the slag dump, the fact that the tracks are moved at 30-day intervals as dumping progresses, at first seemed to be a stumbling block. Permanent overhead could not be installed in this location, necessitating that some means for securing a portable overhead system be devised. The problem was satisfactorily met by placing the wooden poles on four wheeled trucks. These trucks are weighted with slag and operated on short lengths of track placed at right angles to the track rails. To move the overhead system, an additional short section of track is laid on leveled ground against the rails supporting the truck. The truck and pole are then rolled closer to the brink, and the released section of track is carried to the next pole for use there. This method of moving overhead requires very little time and few men. Only a contact wire is carried over the dump tracks. It is supported and insulated with a mine type of hanger.

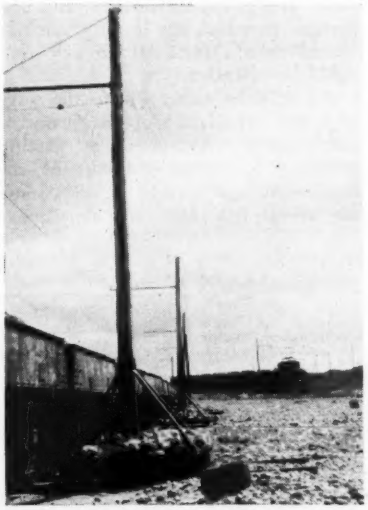


Fig. 5. Poles at this Canadian operation are mounted on trucks which ride along tracks placed at right angles to the haulage tracks

At the same property another interesting construction problem was met in the electrification of the sand pits. Sand used as flux in smelting is taken from pits about 25 feet below normal elevation of the surrounding section. The sand is loaded in cars with a crane and grab-bucket. In these pits, overhead clearance for the crane must be provided; also a means for shifting the overhead along with the track. This was ingeniously solved by stringing cross-span wires at 100-ft. intervals over the pit at the elevation of the original ground. This

Fig. 6. Another type of portable overhead support used at a non-metallic operation

span is carried many feet on each side of the pit on top of the ground and then anchored in some suitable way. As the track is shifted, the contact wire may be shifted into alignment with the track. As new cuts are made in the solid ground, the span wire comes to view and is used later to support the contact wire over the new cut when the track is shifted to that location. Connections between the span wire and contact wire are made with a piece of strand in the shape of an inverted V, the apex of which connects to the span wire and the outer ends to half-strain ears on the contact wire on each side of the span wire. This connection provides a method of easily compensating for track elevations, and also permits the lineman to take slack out of the contact wire without disconnecting the contact wire from the V strand.

Shuttle car operating in low coal

SHUTTLE HAULAGE for MECHANICAL LOADING— Review of Developments

By H. B. HUSBAND

General Manager
Chesapeake & Ohio Railway Fuel Mines

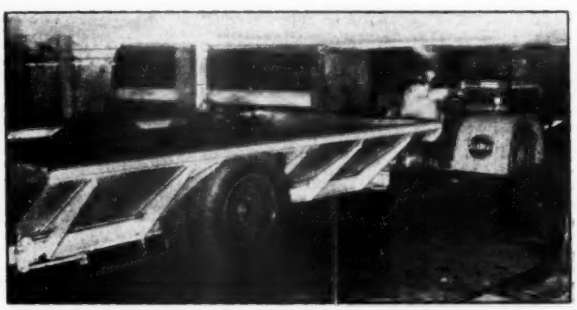
RUBBER-TIRED service cars or "buggies" made their first appearance in the fall of 1936. The first installation was at the mine of the Blue Bird Coal Company at Carrier Mills, Ill., and the second one followed immediately at the mine of the Hart Coal Company at Mortons Gap, Ky. The development of these cars, however, started many years before as an idea, back in the days when an output of 60 tons in an eight-hour shift was a creditable performance for a mechanical loader.

An engineer, looking ahead and thinking, saw that the mechanical defects in the loaders would and could be corrected, that in a comparatively short time the loaders would be loading 5 to 6 tons per minute and that the big problem would be the same as it was then—how to move the coal away from the loading machine fast enough to keep the loader loading.

The engineer worked on storage hoppers and fast-moving conveyors to discharge the hopper into the mine car; skips to shuttle between the mine car and the loading machine; articulating conveyors two cuts long so that one conveyor would discharge into the next and, by keeping the faces equidistant from the entry track, additional units could be added so that the last one reached from the loading machine to the cars on the entry track; kangaroo conveyors operating on two outside tracks so that a string of empties were moved under the conveyor and pulled out loaded; and belt systems in which the loading machine loaded onto a sectionalized belt that could be extended.

All of these either got to the stage of a test installation or passed out as the natural consequence of getting accurate figures on the cost of the equipment and setting it up against the savings, but after every experiment was tried it was found that good track and the largest possible mine cars got the best results.

In 1936 this engineer was given the problem of mining coal from a seam 48 in. thick at a cost to compete with mines in the same territory in seams 8 to 9 ft. thick, with the same freight rate and no favorable differential in the market prices as between the 48-in. coal and the 8 to 9 ft. coal. All of the accepted methods were considered; but none of them, when the expected performance and the costs



Combination tractor-trailer rubber-tired haulage units, typical of early development, have been superseded by single units having their own motive power

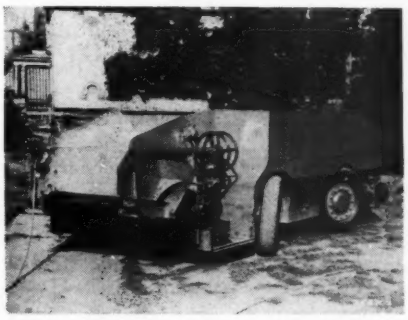
Dumping a load of coal from shuttle car into hopper

were considered, presented a picture attractive enough to warrant the opening of the mine. If the mine was to be opened something radically different had to be tried.

Mr. J. H. Fletcher, of Chicago, is, of course, the engineer I have been talking about; and being a thorough, capable and courageous engineer, he did not hesitate in planning something radically different. He ran into the usual difficulties of anyone trying to change an established system, and could not find anyone to build the cars he had designed. Sanford-Day did agree to build the doors for the car, but Mr. Fletcher had to build the cars or trailers himself in the shop of the Blue Bird Coal Company; and only by personal connections was he able to induce Baker-Raulang to furnish the tractors to pull the cars. Most everyone tried to discourage him—even the representatives of some of the leading manufacturers of mining equipment.

The results at the mines of the Blue Bird Coal Company, Hart Coal Company, Moffatt Coal Company and Engle Coal Company are well known and need no comment. Mr. Fletcher and Mr. A. L. Lee have designed a "Koal-mobile," and the first two will go into the mines of the Union Collieries Company.

The Joy Manufacturing Company, watching and studying the performance of the Fletcher units, developed their shuttle car. The first one had a capacity of 6 tons and was installed late in 1938 in the mine of the Katharine Coal Company at Lumberport, W. Va. The reported results the mine management got with entirely new equipment and an entirely new idea were unbelievable unless one went into the mine and saw the performance. At the present time the Katharine Coal Company is using eight shuttle cars.



The "Koal-mobile," a four-wheel drive and steering unit recently introduced

The next installation was in Consolidation Coal Company mine No. 25, then the Hanna Coal Company mine at Dun Glen, Ohio.

Now there are shuttle cars working in seven states in seams of coal carrying from 36 in. of coal to 12 ft. of lignite. A car 32 in. high is generally applied to lower coal, and there are eight of the 32-in. cars working in Black Mountain Corporation, Kenvir, Harlan County, Ky., and four units working in the mine of the Weaver interests in central Pennsylvania, in 38 to 40 in. of coal.

The cars are also working in the Pittsburgh seam, the Eagle seam, the Pittsburgh seam of northern West Virginia, the Pittsburgh No. 8 seam in Ohio, the Elkhorn No. 1 seam in eastern Kentucky, seams Nos. 5 and 6 of Illinois, No. 9 of western Kentucky, and the lignite seams in eastern Colorado north of Denver.

There are now in operation more than 100 shuttle cars in addition to the Fletcher units. There are about 80 cars on order or in the process of manufacture, and by the 1st of April the first 10-ton shuttle car will be shipped to Sheridan-Wyoming Coal Company. This car is going into 14 ft. of coal.

I cannot say that all rubber-tired installations have been a success. Structural weaknesses have appeared in some of the cars, but this is a matter of mechanical detail and always can be corrected. No engineer can anticipate all the strains to which a car traveling over a mine bottom is subject, and when one considers the short period that rubber-tired haulage has been in use, the fact that the cars have performed as well as they have is a credit to the engineers who designed them and to the operators using them.

Serious changes are taking place in coal-mining methods — changes over which operating men have no control. Most of us, and most industries, do not like change, yet change is the inevitable law of survival. Undoubtedly hand loading is the easiest form of coal loading, and requires the least capital, the least planning and the least supervision. However, changes are forcing mechanical loading, which is always difficult and requires more capital, intensive planning, intensive supervision, and changes in face transportation.

The bulk of production naturally shifts to the areas able to market their coal the best, either because of a lower price or superior quality. Combustion engineers are developing new ideas and applying them to the burning of inferior grades of coal, so that the time is coming when the superior coal will have to compete with inferior coal on a price basis and the 36-in. seam will have to compete with the 84-in. seam on the same basis.

Copper wire is reduced to the desired dimension by a series of diamond dies of graduated sizes. Copper wire can be drawn down to a single strand finer than a human hair, so fine that one pound of metal would reach 70 miles. Copper is the most practical conductor of electricity known to man.

Meeting in Denver with Chairman J. C. Kinnear, the National Program Committee drafted plans for a really outstanding series of discussions on key problems facing the industry. Seated, left to right: H. M. Rives, Chairman Kinnear, J. D. Conover, M. E. Shoup, R. S. Palmer, W. J. Coulter, J. F. McDonald, C. J. Trauerman, D. A. Callahan, H. L. Tedrow and J. A. Magruder. Standing: A. H. Bebee, W. E. Scott, Edward Thornton, Carl Zapffe, H. A. Walker, J. P. Briscoe, M. W. Bowen, C. F. Willis, P. D. McMurrer, and E. D. Dickerman

PLANS PUSHED for METAL MINING CONVENTION

ARRANGEMENTS are advancing rapidly toward early completion of plans for the Seventh Annual Metal Mining Convention and Exposition of the American Mining Congress, convening two months hence—September 16-19—in mile-high Colorado Springs.

Meeting in Denver June 13, the Program Committee, headed by Chairman J. C. Kinnear, got down to brass tacks in selecting a program that will comprise a veritable compendium of leading thought on major issues and operating problems of current interest to metal mine operators. Present at the session pictured above were many of the State and District Chairmen shown on the facing page, augmented by a sizable delegation of prominent Colorado mining men who are especially interested in the meeting's success.

Keynoting the timely discussions will be a session devoted to consideration of "Minerals in the Present Emergency." Dr. C. K. Leith, mineral advisor to the Emergency Council on National Defense, will deliver a message of outstanding interest on "The Role of Minerals in the Present War," while other subjects to be presented by equally well-qualified men are "Strategic Mineral Procurement" and "Financing Development of Domestic Sources of War Minerals."

Another session closely related to the above will be given over to a discussion of "The War's Effect on Metal Mining." Prominent leaders in their respective fields will review the war's effects on supplies, international movements, domestic markets, prices, etc., for zinc, copper, lead, iron ore, gold, silver, mercury, tungsten, and molybdenum. Senator Key Pittman, of Nevada, will again attend the meeting and will discuss "The Future of Gold and Silver in the Light of World Conditions."

Discussion of labor problems, so important in meeting emergency production requirements, will occupy another key session, headlined by a masterful analysis of "Present-Day Industrial Relations" by C. S. Ching, director of industrial and public relations, U. S. Rubber Company; and a skillful analysis of "The National Labor Relations Board—An Example of Administrative Agencies," by Edmund Toland, counsel to the Howard W. Smith Committee, investigating the NLRB. The nation's press has covered some of the startling facts revealed by this committee, and Mr. Toland will explain clearly the dangers arising from agencies which exercise such unbridled powers. "Experience with the Wage-Hour Act" and "The Treatment of Labor Disputes" are other subjects to be handled by authorities at this session.

On one morning or afternoon of the meeting there will be two simultaneous sessions, devoted to discussion of new developments in operating practice (1) in mining and geology, and (2) in milling, placer mine operations, and gold recovery.

A session on the all-important subject of taxation will include addresses on "The Present Tax Situation," "The Treasury's Position on Revenue Legislation," and "Specific Tax Problems of Metal Mining"; and the health and safety session will feature papers on "Progress in Mine Safety," "Sick Absenteeism in the Mining Industry," and "Propaganda and Practical Experience in Dust Control."

Other topics of prime importance to metal mining men scheduled on the preliminary program include: "Fiscal and Monetary Policies of the United States," "Expansion of RFC Loans for Mining," "Industrial Uses of Silver," "Public Mineral Land Withdrawals," and "Public Relations of the Metal Mining Industry." Ample time for open discussions of these and other subjects, to bring out the full viewpoint of western mining men, has been provided by the Program Committee.

Entertainment and Trips

Tentative entertainment plans now being developed by Merrill E. Shoup, chairman of the Western Division, and the committees serving under his leadership, include:

A welcoming luncheon on Monday noon, featuring an address by Governor Ralph Carr, of Colorado.

An informal dinner-dance at the beautiful Hawaiian Village, Broadmoor Golf Club, on Monday evening.

Steak fry on lofty Cheyenne Mountain, Tuesday evening.

Ice carnival at the Broadmoor Ice Palace, Wednesday evening.

Annual banquet Thursday night, with an address by a high figure in national affairs.

Special fun features are also being

arranged to assure pleasant hours of leisure for the visiting ladies throughout the week.

Inspection trips to famous mining enterprises within easy striking distance of Colorado Springs are being planned for Friday and Saturday. Special points of interest include the Golden Cycle Mill, the habitually world-record-breaking Carlton Tunnel, Cripple Creek, Climax, Leadville, and other districts. Special arrangements are also being made for those who wish to visit the Pueblo operations of Colorado Fuel & Iron Corporation.

Ample opportunity is afforded those inclined toward sports for filling in odd moments of leisure. Golf privileges will be available at Broadmoor and Colorado Springs Country Clubs; and there'll be chances for swimming, ice-skating, etc. Unrivaled scenic attractions are readily available from Colorado Springs over splendid motor roads.

Comprehensive Exposition

The spacious exhibit hall at the Broadmoor will be transformed into what promises to be the most comprehensive, instructive, and colorful exposition of metal mining equipment and supplies ever staged. Reservations continue to come into the Washington office, presaging a capacity "house" when the curtain rises. A large number of manufacturers, recognizing the unrivaled opportunity of contacting at a central location responsible operating officials and staff members from widely scattered metal properties, were quick to reserve choice locations; but a few desirable spaces remain as this is written, and those not yet "in" are urged to act quickly if they are to be assured adequate representation at this important gathering.

Operating men, in turn, eagerly seize on the privilege of viewing and studying this giant "show case" of what's new and necessary in up-to-date mine operation, and of tapping the expert knowledge of manufacturers' representatives for a solution of vexatious problems.

All in all, it's going to be the best convention and show in the history of these western meetings—so make your own plans definite NOW to be on hand and profit from its countless attractions.

State and District Chairmen of the Program Committee Serving With General Chairman J. C. Kinnear

H. A. WALKER
South Dakota

D. M. KELL
Montana

H. M. LAVENDER
Arizona

T. M. CRAMI
New Mexico

C. L. BRANSFORD
Southeastern

J. D. MacKEN
Texas

L. G. JOHNSON
Tri-State

CARL ZAPFFE
Lake Superior

NOBLE H. GETCHELL
Nevada

H. L. FAULKNER
Alaska

LEWIS P. LARSEN
Washington

E. B. DeGOL
California

RUSSELL B. PAUL
Northeastern

L. E. HANLEY
Idaho

JAMES IVERS
Utah

JEAN McCALLUM
Mississippi Valley

J. PRICE BRISCOE
Colorado

W. H. CULL
Oregon

The March of COAL MINING

Ten Years of Progress

FUNDAMENTALS OF MODERN COAL PREPARATION

By G. B. SOUTHWARD

Mining Engineer
American Mining Congress

MODERN coal preparation has become a rather complicated procedure, but there is nothing mysterious about it, and the principles of mechanical separation, through application of the laws of specific gravity, have been known and practiced for a great many years. The earlier installations, however, were rather simple in comparison to a modern cleaning plant with its complex arrangement for screening, cleaning, mixing and blending. All of these modern processes have grown up over the past 10 years, and their development, by a comparatively small number of companies, has established certain rules of procedure which can be applied generally by the coal industry.

A coal operator who contemplates a cleaning plant at his mine is apt to become confused by the complexities which enter into the selection of the process which will best suit his conditions. Like many other things, these complexities are magnified because the problem is apt to be viewed in its entirety, and there are so many details to be taken into account that a complete, or birdseye, view is not possible. However, if one step is faced at a time, and if the answer to each of these steps is worked out as a separate calculation in itself, then the entire problem becomes a series of solvable parts. Furthermore, by breaking up the total problem into its component parts, it will be found that many of these are of such a nature that the solution, when worked out and presented by men who have specialized training, can be readily understood by the average operator or engineer, even though he himself is not experienced as a coal cleaning expert.

Importance of Screening

Coal preparation consists of two principal stages—sizing and cleaning. It used to be that these were entirely separate problems, but today in modern practices, they are very closely related. For example, it is usually found that the major part of a seam's impurities occur in certain well defined size limits, and as a consequence, the screening specifications may materially affect the ash content in certain of the prepared sizes. But even where this is not the situation, there is no known cleaning process which can take unscreened run-of-mine coal and separate the impurities so that a uniform product will result.

It is immediately obvious, therefore, that before a preparation method can be decided upon, the operator must first know what sizes he will be required to furnish to his market and how each of these sizes analyze at his mine. His next step is to determine what method of screening must be installed to obtain these sizes. This in itself is not the simple matter that it used to be, as modern practice has shown that, in addition to screening tests, a rather detailed investigation must be made on a number of factors which will have some effect on the design of the screening plant. A data sheet, submitted by our Coal Division Committee on Surface Preparation, and published in the July, 1939, issue of THE MINING CONGRESS JOURNAL, shows a recommended method of approach to this phase of preparation.

Examination of Seam Characteristics

A coal seam is seldom composed entirely of clean coal, and neither is it a simple arrangement of coal and slate bands. Instead, it is more often composed of several different kinds of coal and several different kinds of impurities; furthermore, each of these different materials may require different treatment for their separation. A careful examination of these various components must necessarily be made before any definite plan for their separation can be devised, but ways to do this have been worked out, and the practicability of ash removal from any of the prepared sizes can be determined with a reasonable degree of accuracy by float-and-sink tests. Then, with this data as a basis, it becomes largely an arithmetical matter to calculate the cost of such preparation and the benefits in realization which will be derived.

In figuring these costs, three factors must be taken into account: (1) the actual cost of operating a cleaning process, such as attendance, power, maintenance, etc.; (2) the interest and depreciation on the plant investment; and (3) the increased operating cost of the mine caused by the decrease in tonnage lost in the reject.

Charts to Show Seam Components

The two accompanying charts illustrate the manner in which a coal operating company recently made an investigation and analysis of the vari-

ous materials occurring in their seam, in order to determine their economic relation to the final prepared products. Both of these charts contain the same information, but present it in two different ways.

Chart A shows in Figure 1 the seam composition as mined and brought to the surface, and it will be noted that this consists of the following three classes of material: (1) raw coal, (2) mine refuse, which is slate and coal loaded into special cars, and (3) barren roof slate which is loaded separately from the coal and the refuse. These divisions are automatically set by the natural composition of the seam.

Figure 2 shows the result after passing the raw coal through the cleaning plant and the picking tables. Three main products are made—the metallurgical coal which goes into the railroad cars, the slate from picking tables and the wash box reject which goes directly to the outside waste dump.

Figure 2-A shows the composition of the wash box reject, which consists of pure slate and a large percentage of recoverable steam coal. This amount of steam coal is allowed to pass into the reject because of the fact that its lower quality will not permit it to be mixed with the high grade metallurgical fuel.

Figure 3 shows the composition of the mine refuse brought to the outside in slate cars. This material also has a large percentage of recoverable steam coal, which, as in the case of Figure 2-A, is not of sufficient high quality to mix with the metallurgical fuel.

Figure 4 shows the analysis of the roof slate, which has such a small percentage of coal mixed with it that its recovery would not be economically practicable.

Chart B shows, in one figure, the combination of all these components as determined by the separate analyses shown in Chart A. The prepared coal from the tipple and the cleaning plant amounts to about 80 percent of the total mined product; however, in the other material, which normally would be considered as waste, there is over 30 percent of recoverable coal. This amounts to approximately 7 percent of the entire mined product, so that by recovering and utilizing the fuel in the waste product, the total yield from this mine would be raised accordingly.

As a result of the investigation which is illustrated in these charts this company is now reclaiming a large part of the fuel in the refuse that was formerly wasted, and plans are under consideration to make this recovery complete.

Determination of Reject

The amount of coal in a wash box reject is not necessarily an indication of inefficiency in the mechanical process used. It seldom if ever happens that there is a marked difference in specific gravity between the coal and all of the impurities in the seam; consequently, the operator is faced with two decisions—either to have a small amount of fuel value in the wash box refuse, or to have a small amount of slate in the clean coal. Ordinarily, a compromise is effected, and the amount of coal which passes into the reject is determined by the analysis desired in the finished product, and this in turn is set by the use of the fuel by the consumer.

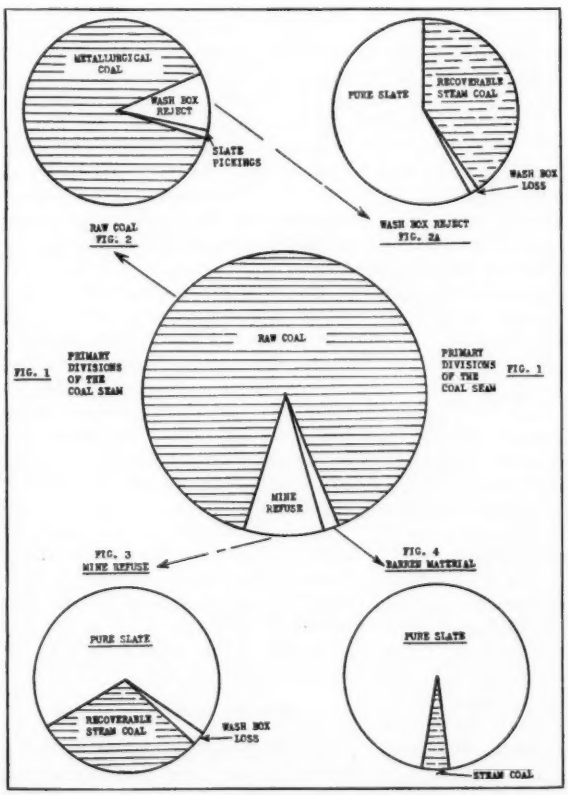


Chart A. Analysis of the different portions of the seam

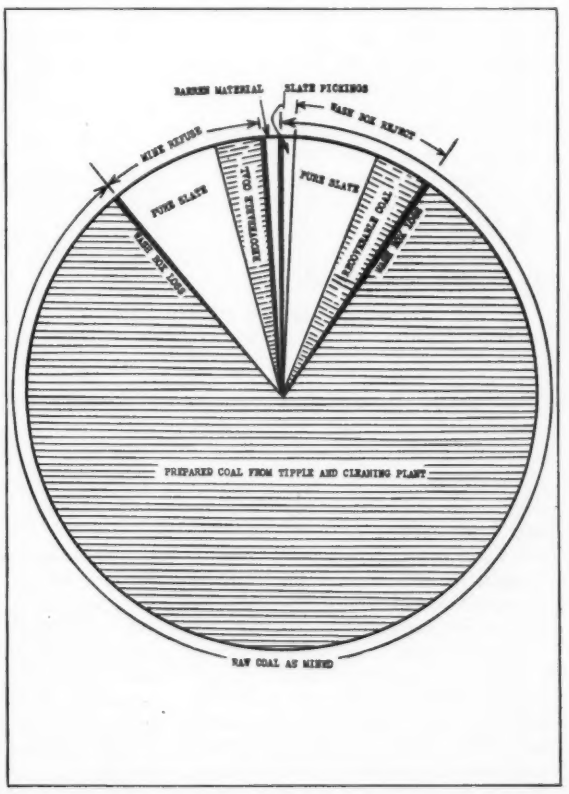


Chart B. Total seam as divided into various components

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

SERVICE HAULAGE FOR TRACK MOUNTED MECHANICAL LOADING

• A Report by the Committee on Haulage Roads

THIS report covers the service haulage system as used at the mine shown on the accompanying map. This is operated with track mounted mobile loading machines, track mounted cutters, and high capacity steel mine cars, and since a large tonnage is produced from this area, the haulage system is an extremely important factor. Three types of haulage are used: (1) main line, (2) relay or intermediate, and (3) service. The term "service haulage" refers to the actual placing of the cars at the loading machine, and shifting them from there to the relay motor.

The main line motor delivers empties and picks up loads at the main parting, or side track. From this point, the relay or intermediate motors transport the empties into the working sections where they pick up the loads and take them back to the parting. Each relay motor handles five loading machine crews, and as these locomotives necessarily have to go into the mining sections, and in many cases have to go beyond the fresh intake air, they have to be of explosion-proof cable reel design.

Sizes of Track and Ties

In the mining section, the butt headings and face entry connections between these butts are laid according to what is termed Class "B" track specifications, which consist of 40-lb. rail laid on 4-in. by 6-in. by 6-in. chromated zinc chloride treated ties with steel ties interspaced at approximately 6-ft. intervals. That has been the standard up until recently, but now this is gradually being changed to the use of a special tie—a combination of steel and wood—for this service, including turnouts.

Track in rooms and working places is similar to that in the butts, except, that it is laid entirely on steel ties, including special switch tie sets of 4 ties each. Some combination steel-and-wood ties are used in the working sections to help keep the track level where the bottom dips.

Class "B" track is laid to sight line, 1 ft. off the center line of the entry, so as to provide the 30 in. clearance on the side opposite the trolley wire. This is kept fairly straight, although not nearly as straight as the main line track work. The ties are filled in with ballast comprised of mine refuse; in some places the ties rest on the actual bottom and in others on refuse ballast to keep them in somewhat uniform grade.

All turnouts are No. 2½. All rail is 40-lb., and 4-hole angle bars only are used. There are some 2-hole angle bars on hand, but these are being dis-

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This report is presented to the Committee on Haulage Roads to assist in their study on service haulage tracks. As a first step in this study, the committee is collecting plans and specifications of a number of typical, successful service haulage operations for mobile mechanical loading.

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continued as they have not proved satisfactory for this mine.

At some of the more important switches, particularly those where a butt entry turns off the main face entry, a No. 3 40-lb. turnout is used; in many cases instead of 40-lb. track, the face entries are laid with 60-lb. track and 60-lb. turnouts for 200 or 300 ft. around into the butts. All turnouts, without exception, have switch throws. All frogs are cast manganese steel, flange bearing, self-guarded. Only new billet rail is purchased on a specification of .50 carbon content.

Steel ties weighing 3¼ lbs. per lineal foot are exclusively used. Switch ties come in sets of 4 weighing 4¼ lbs. per lineal foot, and two of these ties are extended to provide a base for the switch throw. The switch throws all have spring connecting rods. In some cases a fifth special tie is used for the switches; this is of some advantage in stiffening the turnout. This, however, is not yet adopted as standard.

Steel Ties Depressed on Ends

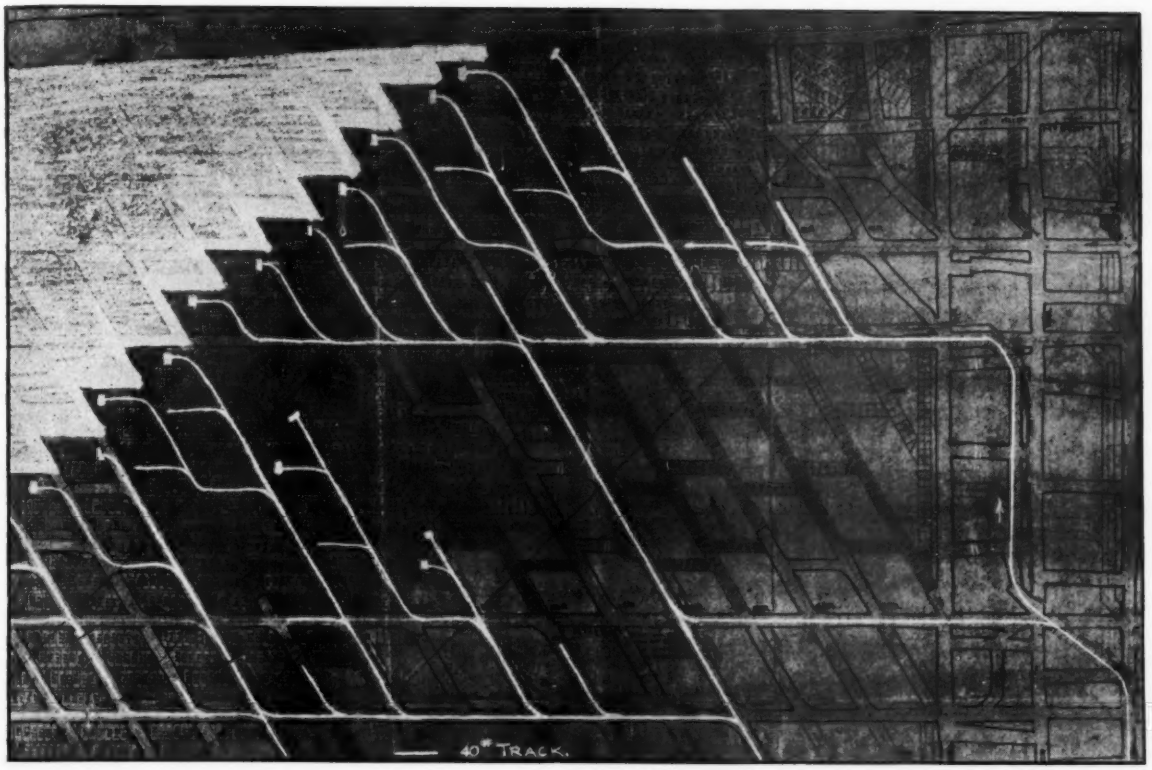
The steel ties are all dove-tailed or depressed on the end; this feature is found to be of material advantage in preventing the track from slipping sideways on the bottom, and it is also of considerable assistance in preventing cables from getting caught under the ties. This depressed end has another advantage in that it helps to prevent center buckling of the ties between the rails.

The steel ties have fixed clips on the outside only, so as to help keep the rails in exact gauge. The combination steel and wood ties have alternate inside and outside fixed clips, because these ties frequently have to be inserted in track that was already laid for development and could not otherwise be used without tearing the track to pieces.

Air locks of two or three doors are used on all butts to separate the mining territory from those parts of the butts which are wired and are on the fresh intake air. Of course, no trolley wire or feeder lines extend beyond the doors.

Bonding and Return Line

All the track is bonded as far as the trolley or feeder lines extend. In addition, there is a 4/0 return line, nailed along the rib about middleways



Map showing relay and service haulage tracks

up, extending everywhere the trolley wire goes. This is for the purpose of attaching the return nip of the cable reels, and also serves as an additional return since it is cross-bonded to the rails. The rails are also bonded and cross-bonded.

On the blueprint of a typical working section the active working places are indicated by rectangle. The light colored portion indicates the gob area where all coal has been extracted and the roof caved. In pillar extraction it is necessary to have many curves, and the laying of such naturally takes more labor than straight track.

All track crews have a push truck on which to carry tools, rails, ties, etc. Each truck, in addition to the normal tools, is equipped with an aluminum punch for making holes where necessary in the ends of rails, and an aluminum rail bender. Each truck is also equipped with a level which is of assistance to the trackmen in keeping the rails level with each other. This is particularly useful, since much of the track is on curves where it is sometimes hard to see, with the naked eye, whether the track is level, and since the bottom, even in narrow work, has a tendency to heave slightly (this even occurring on the main line thousands of feet from any workings.

Car Service Features

As before mentioned, the relay motor brings empties into a section by pulling them; then, at the runaround track, the locomotive gets behind the empties and pushes them up into the active working section, spotting a few cars here and there at places convenient to the loading machine and as directed by the loading machine crew or the assistant mine foreman in charge of the section.

The relay motor then proceeds to pick up loads in the rooms and breakthroughs, wherever left by the gathering or service locomotives. After gathering all available loads this locomotive then pulls them out to the main parting.

The service or gathering locomotive is used only for shifting cars behind the loading machine, and the layout is designed to avoid any unnecessary tramming distances.

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

THE plans of Administration leaders to adjourn the Congress by June 22 were frustrated by the majority of reluctant Congressmen who had felt the pressure from back home to keep the Congress in session, and thereby do everything possible to keep the country out of war. Republican members took a firm stand on the adjournment issue, with the result that only a week's recess was taken for the Republican National Convention and the Congress reconvened on July 1. With their legislative program complete the majority party leaders are still hopeful that they will be able to bring about an adjournment before July 15, the date for the Democratic National Convention, as the prolongation of the present session is anything but helpful to their desires in this election year.

The appointment of former President Hoover's Secretary of State Henry L. Stimson as Secretary of War and the 1936 Vice Presidential candidate, Frank Knox of Chicago, as Secretary of the Navy is taken in some quarters as being of more significance than a mere political strategem. Some observers view the rebirth of the Republican Party under vigorous leadership and the abandonment of the old line Republican controls as the forerunner of a probable change in the nation's Administration following the November election. If such should be the case the new Republican Secretaries of War and Navy will have been at their posts for over half a year in the present serious international situation when the new Administration takes office.

Taxation

The new billion-dollar Revenue Act of 1940 was approved by the President at 11:45 a. m. June 25, with income tax features retroactive to January 1, 1940. The excise tax changes became effective July 1 and estate and gift tax increases apply from the date of the President's signature.

Mineral producers were seriously concerned at the action taken on the Senate floor in including the LaFollette excess profits tax and the Connally war profits tax levies as amendments. Representations were made by the American Mining Congress to Ways and Means and Senate Finance Committee conferees against both the LaFollette and Connally amendments, stating that the industry had no means of knowing what effect such extremely complicated changes would have upon productive enterprise. Certain it is that the inclusion of the Connally amendment which embodies a reduction of 50 percent in discovery and percentage depletion allowances would be disastrous. The depletion rates have been determined upon and approved by session after session of the Congress and it is well recognized that they are based upon actual experience with the income tax law since its inception in 1913.

In reporting the Revenue Bill the House and Senate conferees recommended that an excess profits tax be prepared and that the Treasury be instructed to present a draft of such a tax to the Congress on October 1. Following this action the President went on record in an 89-word message to the Congress asking for a steeply graduated excess profits tax. Conferences are now proceeding between Treasury Secretary Morgenthau and members of the Congressional Joint Committee on Internal Revenue Taxation and it is considered certain that some tax of this sort will be enacted before the end of the present year.

The Bituminous Coal Division, Department of Interior, is pushing forward toward the placing in effect of minimum prices on all grades and sizes of bituminous coal in all coal fields and marketing areas of the country. It is now stated that prices will be proclaimed some time after August 1, although it is entirely possible that the necessities of the national defense program may have some unforeseen effect upon this idealistic legislation.

National Labor Relations Board

Since the House by a vote of 258 to 129 passed the Howard W. Smith amendments to the National Labor Relations Act, the course of this much needed legislation has been blocked by tactics of delay in the Committee on Education and Labor of the Senate. The plea has been that because of the uncertainty surrounding the adjournment of the Congress, action by this Committee, headed by Senator Elbert Thomas of Utah, need not be hurried. The facts are that the Committee devoted many months in 1939 and again in 1940 to hearings on proposed amendments to the Act. The Committee was charged by the press throughout the country with responsibility for undue delay, and countless blockading strategies were perpetrated by National Labor Relations Board members and their staff employes. The temper of the Senate today is such that if the Education and Labor Committee will report the bill it can be considered and passed before the present session of the Congress adjourns. Certainly the Howard W. Smith Investigating Committee has furnished the public with ample official proof that both the present law and the actions of the present Board and its staff are seriously at fault.

Of a kindred nature to the Wagner Act is the so-called LaFollette "Civil Liberties Bill" (S. 1970) which after passing the Senate has lain dormant in the House Committee on Labor. The bill deals with the use of strike-breakers, special agents and "industrial munitions" and is a particularly unwise piece of legislation at this time, when in connection with our national

defense program every plant manager must be ever vigilant against acts of sabotage. The feature of the bill which limits to 10 percent the amount of the payroll which can be devoted to alien employes has been pointedly brought to the attention of the congressional delegations from our Mexican border states, and it is believed that this amendment (introduced by Senator Reynolds of North Carolina) will be very carefully considered in the event the LaFollette bill again becomes active.

Federal Mine Inspection

Exhaustive hearings on the Neely mine inspection bill (S. 2420) were concluded on June 14 with a series of appearances by Governor Holt of West Virginia, a number of state mine inspectors and several coal producers from Virginia and West Virginia. No extensive rebuttal was offered by the United Mine Workers or by the Department of Interior, and Representative Andrew L. Somers' Mines and Mining Subcommittee of the House now has the bill under advisement. The many opponents of the Neely bill continued in their testimony to make the constructive suggestion that the Health and Safety Branch of the United States Bureau of Mines be given materially increased appropriations with which to pursue its regular work in assisting State Mining Departments, coal producers and mine workers in vigorous safety campaigns. The Subcommittee has a heavy task before it in reviewing the large volume of testimony and the numerous exhibits presented, and it is not known when the results of this study will be made available.

Stream Pollution

After several meetings of the conferees on the Barkley-Mansfield water pollution bill it is understood that the Senate conferees are continuing to insist that the so-called Mundt amendments be eliminated. Senate conferees are also asking that the grants-in-aid features of the original Barkley bill be restored so that municipalities and states may secure this additional assistance in coping with pollution problems. It is thought possible that the House conferees may have to take the disagreement on the Mundt amendments back to the House floor for a vote, and such action is looked for some time in the next few weeks. It should be remembered that the Mundt amendments make "new sources" of pollution a public nuisance and authorize Federal district attorneys to bring action for abatement.

Strategic Materials

Senator Murray's bill, S. 4008, passed the Senate on June 22 and is now in the House Committee on Banking and Currency. It would authorize the R. F. C. to make loans up to $40,000 for the development of gold, silver and tin and strategic and critical minerals "of value to the United States in time of war." In the House Representative Luce, Republican of Massachusetts, has objected to the bill because it embodies the development of silver mines, but it is believed that his objection will be removed when the explanation is made that gold, silver and tin were included in the original Pittman bill passed five years ago and that the new bill merely adds the strategic and critical minerals.

Another R. F. C. loan bill (S. 3938) authorizes the creation of corporations to which loans may be made for the purpose of producing, acquiring and carrying strategic and critical materials. The newly created corporations may "make payments against the purchase price to be paid for strategic and critical materials in advance of the delivery." The word "producing" was placed in the bill as an amendment by Senator Murray of Montana ably assisted by Senator Ashurst of Arizona. Representative Scrugham of Nevada has also secured an appropriation of $2,000,000 for the beneficiation of manganese ores and the erection of a pilot plant to produce manganese by the new electrolytic processes.

The U. S. Bureau of Mines and Geological Survey field work on strategic minerals is reported to have progressed with appreciable success on manganese, chromite, tungsten, mercury and antimony but the results on tin are said to be negative.

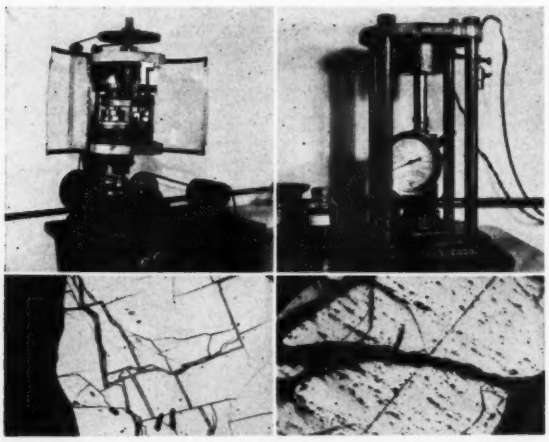
Pleasure craft in the Washington Yacht Basin

NEWS and VIEWS

New Equipment for Montana School of Mines

Modern mineral dressing has to do mainly with the concentration of low-grade ores and the old methods of testing are not adequate for this purpose. Therefore, equipment recently constructed by the Work Projects Administration for the mineral dressing department of the Montana School of Mines has been invaluable in the preparation of polished mineral surfaces so necessary in the promotion of research in the field of microscopy as applied to the mineral industry, Dr. S. R. B. Cooke recently stated in making a report on progress.

Dr. Cooke, research professor of mineral dressing at the Montana School of Mines, stated that such research has been curtailed at the school owing to the limited budget provided for such work. This obstacle was overcome through cooperation with the Work Projects Administration, whose employes built the machines under the direction of Dr. Cooke and his predecessor, Dr. A. M. Gaudin. Details of the cooperative program were drawn up by Dr. Francis A. Thomson, president of the School of Mines, and W. T. Beaumont, who is in charge of the research and records section of the Work Projects Administration.



Upper left, the modified Graton-Vanderwilt polishing machine; upper right, briquetting press. Lower right and left contrast polishing by old and modern methods

For the identification of opaque minerals, it is necessary to prepare highly polished sections which are essentially plane, showing little relief and retaining no fractures or scratches caused by the grinding process. A briquetting press is used to secure specimens of regular shape. These may be conveniently held in an automatic polishing machine. The press built by the Work Projects Administration employes at the school of mines shops is shown in upper right.

Briefly, briquetting consists of placing the mineral or ores in a matrix of uncured bakelite or lucite powder and subjecting the whole sample to a temperature of approximately 150 degrees centigrade and to a pressure ranging from 2 to 5 tons per square inch. This treatment "cures" the matrix, and the final product is a hard and dense briquette of regular shape. The mounted mineral sample is then ground to a flat surface with relatively coarse alundum or carborundum on a glass plate, after which it is placed in the polishing machine and subjected to a process of fine grinding and polishing. It is then ready for microscopic examination. This method of mounting is particularly effective for the preparation and examination of finely ground materials, such as various mill products.

Upper left shows the modified Graton-Vanderwilt polishing machine which was built almost in its entirety by Work Projects Administration employes. The specimens are shown in position for polishing after the briquettes have been coarse-ground. Six specimens can be placed in the machine at one time.

There is a vast difference between the new polishing machine and the older types of equipment, Dr. Cooke stated. In the older machines the polished specimens contained scratches and the grinding was not uniform as the harder materials were not ground to an equal surface with the softer materials. Due to the scratches and uneven grinding it is not possible to obtain the information on the smaller particles of material as it is with the new type of polished samples.

Lower left and right show a sample of Butte ore polished by the new and old methods, respectively. The light mineral is pyrite, the dark mineral bornite and the grey mineral occurring in the pyrite along cleavage planes and cracks is chalcopyrite.

It is within reason to state that as a result of the new equipment, mineral dressing information will be obtained which will be of great value to the mining industry of Montana and to the mining industry of the entire United States, especially in the field of low-grade ores, Dr. Cooke stated.

All work accomplished is part of the Mineral Resources survey of the Work Projects Administration sponsored by the Montana School of Mines. The project is under the supervision of Dr. Francis A. Thomson for the sponsor, and Carl J. Trauerman and Cecil R. Waldron for the Work Projects Administration.

Personnel Changes of Hanna Coal Company

R. V. Clay, vice president and general manager of Hanna Coal Company of Ohio, who has been connected with the company in eastern Ohio for the past 23 years, will assume new duties July 15. He will thereafter make his headquarters at the Cleveland office.

Filling the vacancy as general manager in charge of operations will be James Hyslop of Terre Haute, Ind., general manager of the Walter Bledsoe Coal Company there. Mr. Hyslop is well known in the coal industry in the midwest and has built an enviable reputation as an operating executive. He and his family will move to St. Clairsville in July.

The change in supervision of the Hanna mines was announced late in June by R. L. Ireland, Jr., president of the company, who stated that Mr. Clay would be associated with himself in the marketing and executive end of the business in Cleveland after July 15.

When Mr. Clay joins the Cleveland office this month, the change will remove an executive from the eastern Ohio field who is probably the best known coal official in the district and holds a wide circle of friends among the operators and miners as well, although it is expected his new duties will require him to maintain many contacts with the operating department and public here.

The Hanna Company operates mines at Willow Grove in Belmont County, Piney Fork and Dun Glen in Jefferson County and at Georgetown in Harrison County. They have an annual payroll of nearly three and one-half million dollars and are regarded as the foremost operators in Ohio, both from a pioneering and production standpoint.

Illinois Mining Institute Combines Pleasure With Business On Annual Boat Trip

With a full passenger list of 105 mining men and manufacturers' representatives filling even emergency accommodations on the S.S. *Golden Eagle*, one of the most successful boat trips of the Illinois Mining Institute ever held was staged on the Mississippi River north of St. Louis on June 7, 8, and 9. Perfect weather combined with the excellent crowd and a splendid technical program to give those who made the trip an A-1 outing.

Following an address of welcome by President Roy L. Adams, the chair was turned over to F. S. Pfahler, president of the Superior Coal Company, who presided during the morning and afternoon sessions.

Preceding the presentation of papers, delegates heard a report from John E. Jones, mining engineer of Old Ben Coal Corporation, on work accomplished by his Committee on Mine Roof and Rib Falls. In accordance with action taken at the November annual meeting in Springfield, conferences were held with U. S. Bureau of Mines' officials, who, while evidencing much enthusiasm about the possibility of cooperative work, stated that there was no chance for undertaking this with the appropriations under which the Bureau is now operating. It was Mr. Jones' suggestion that owing to crucial international conditions, work be carried on by this committee without cost. He also referred at some length to his own mimeographed work dealing with better roof sounding methods.

In recognition of the fine contributions made in a lifetime devoted to the coal industry, Fred Weissenborn, of the Illinois Coal Operators Association, was presented with an honorary life membership of the Illinois Mining Institute.

A paper on "Relations of the Development in Illinois Oil Fields to the Hazards of Coal Mine Operations" was then presented by William J. Johnson, state mine inspector, who gave a clear exposition of the future dangers involved in mining out the coal now being pierced with large numbers of oil wells in the Illinois petroleum expansion program. Citing the certain future hazards of sudden liberation of gas and water from tapping old uncharted and unplugged wells in coal development work, Mr. Johnson stated that too many wells are now being drilled, many of which are not properly reported as to location, emphasized the lack of "teeth" in the state plugging laws, and urged the enactment of practical yet flexible legislation requiring a bond for drilling, adequate logging, and, for poorly logged holes, complete filling of hole with cement or slurry.

M. M. Leighton, chief of the Illinois Geological Survey, pointed out the careful work that was being done in spotting on a map all wells now being drilled, and urged that a program be developed whereby young geologists under adequate supervision would keep records of key wells drilled as they penetrated the coal measures. Past experiences with difficulties involved in developing coal in old oil districts were outlined by John E. Jones, W. P. Young and F. S. Pfahler.

F. A. Lyons, Pyramid Coal Corporation, in presenting a paper on "Coal Cleaning and Preparation," outlined earliest lack of methods together with first efforts to clean coal with washboxes and screens in the early part of the 20th century. He stressed the recent spurt in mechanization which has led to modern coal cleaning methods of today, and proceeded to describe in detail the new Pyramid plant at Pinckneyville, producing 750 tons per hour.

In the afternoon session H. C. McCollum, of Allen & Garcia Company, described underground trucking methods now in use in a mine in the Springfield district where shuttle cars have been in constant use since December 1939. This system, which took the place of mule haulage, was described as a complete success, with labor savings of five men per loading machine unit, together with increased tonnage per machine shift and elimination of track materials. Lively discussion ensued, participated in by T. J. Thomas, R. L. Adams, James H. Fletcher, John E. Jones and J. B. Haskell.

In discussing "Modern Underground Methods," A. K. Hert, general superintendent, Snow Hill Coal Corporation, described the impressive work in efficient mining being conducted at their operations under difficult conditions. Four major factors influencing loading machine performance, in order of relative importance, were listed as follows: (1) management, (2) face preparation, (3) track systems and car change and (4) roof control. Importance of efficient haulage in bettering performance was particularly stressed. Pertinent discussion was presented by Morris Cunningham, Raymond Mancha, Howard Lewis, T. J. Thomas, and R. L. Adams.

The afternoon session was brought to a close by a lengthy description of the importance of the recent St. Louis smoke ordinance as it pertains to the future of Illinois coal mining by J. E. Hitt of Walter Bledsoe & Company. Those present voted unanimously in sympathy with a resolution strongly protesting the ordinance, but postponed formal action on passage of the resolution pending complete canvassing of the membership of the Institute by mail ballot.

Mine Safety Conference of Lake Superior Mining Section

The 17th Annual Mine Safety Conference of the Lake Superior Mining Section, National Safety Council, was held in Duluth, Minn., June 20-21, 1940. Papers presented on the two-day program were as follows:

"Supervision and Safety," by J. C. Stennett, safety engineer, National Safety Council.

"The Use and Care of Electric Cap Lamps," by George Knoll, district manager, Mine Safety Appliances Co.

"Blasting Safely," by J. C. Sullivan, mining engineer, Newport Mine, Pickands, Mather & Co.

"Open Pit Mining," by H. M. Rutherford, pit foreman, Mahoning Mine, Pickands, Mather & Co.

"Discipline in Mine Safety," by William Conibear, assistant superintendent, The Cleveland-Cliffs Iron Co.

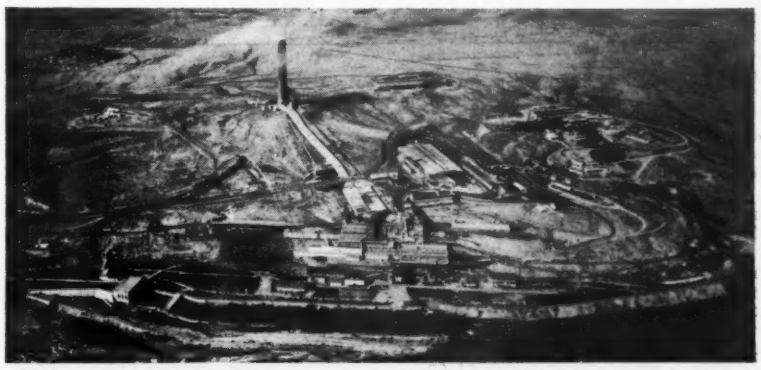
"Safety in Raising," by W. P. Wolff, chief engineer, Oliver Iron Mining Co.

"Teaching Bosses and Men to be More Safety Conscious," by R. C. Mahon, superintendent, Homer Mine, M. A. Hanna Co.

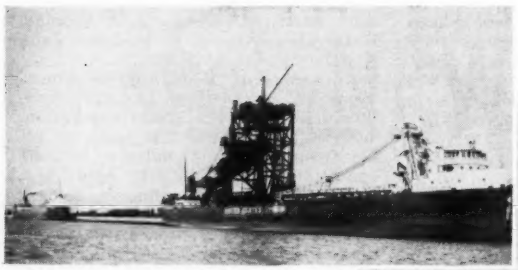
"Accidents From Falls of Ground," by J. A. Beecroft, county mine inspector, Keewatin, Itasca County, Minn.

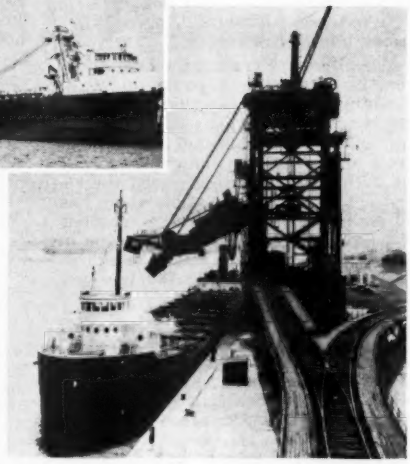
"Bonuses, Safety Incentives, and Other Methods of Interesting Bosses in Safety," by A. H. Testrail, range safety inspector, Pickands, Mather & Co.

"Underground Haulage Accidents," by J. P. Victor, safety engineer, Castile Mining Co.



Pressing demands in connection with the armaments program will soon see capacity operations in the copper and zinc industries. Shown above is the Reduction Department of Anaconda Copper Mining Company at Great Falls, Mont., one of the largest sources in the country of electrolytic copper and zinc





Car Dumper Empties A-Car-A-Minute

A new car dumper recently built for the Pennsylvania Railroad by the Heyl & Patterson, Inc., is capable of emptying 60 cars an hour. The dumper is located at Sandusky, Ohio, where it is an example of the most modern methods of coal handling. A lift-and-turn-over type, the car dumper is built to handle 120-ton cars at a rate of 45 per hour, or 90-ton cars at a rate of a car a minute. The electrical equipment, supplied by the General Electric Company, is conservatively designed to handle the full capacity of the dumper on a continuous basis, and is so flexibly arranged that the dumper can still handle the maximum load even though a major piece of electrical equipment should fail.

In addition to the fact that the two motor-generator sets, each rated 1,275 kw. at 720 r.p.m., which supply d.-c. power for the mule and cradle drives, as well as the auxiliary drives, makes it one of the most powerful dumpers built to date, every effort has been made to make the plant as nearly automatic in operation as possible. Car retarders are used in the mule pit, cradle and runback track to eliminate the necessity for car riders. Electric locomotives deliver the cars from the storage yard to the mule pit.

Special thrustor brakes are used on the main drives, each of these brakes having a sufficient capacity to hold the cradle in position, so that reroping can be carried on without anchoring the cradle. The dumping rate is also aided by equipment for spotting cars on the dumper which includes a car retarder on the platen to stop loaded cars having a speed of five to six m.p.h. within five seconds and 22 feet of travel. Cradle operating speeds permit hoisting, dumping, and lowering the car within the allotted time and automatic control regulates the speeds at critical points in the cycle.

Another feature that speeds up the dumping rate and avoids degradation of the coal is a coal flow retarder with a 54-ft. baffle and a travel of 15 feet in the pan from the top position at the lip of the overturning car. The coal flow retarder is for two purposes—to permit rapid loading and to avoid degradation. The retarder prevents a drop and free run of coal in the pan and also permits the continuous loading of coal in the vessel during the intermittent dumping of coal.

The plant is completely electrical. The power company serving Pennsylvania Railroad supplies 3-phase, 60-cycle current at 23,000 volts to the plant and this voltage is reduced to 2,300 volts by a substation on the premises. Generator-field control (Ward Leonard) is employed on both mule and cradle drives. D.-c. rheostat control is used on the auxiliary drives, including pan hoist, girder screw, and chute motors.

A novel attraction of the dumper is the fact that one generator on each of the main sets is connected to the mule and the same hook-up is used on the cradle, which is counter-weighted to reduce power demands. By means of this arrangement, it is possible to obtain a diversity of loading on the motor-generator sets. When the mule is handling a loaded car, the cradle is coming down light. Likewise, when the load on the mule is light, the cradle is being hoisted under load. Another important advantage of this system of connection is that the dumper can still handle coal even though a major piece of apparatus should fail.

In erecting the plant, special care was taken to combine attractiveness with utility. The engine room is ventilated by a blower and filter arrangement so that fresh, clean air is supplied at all times. The dumper is equipped with floodlights for night operation.

Fuel Engineers Meet In Washington

Industrial executives, fuel engineers, power engineers and others interested in fuel technology from the Carolinas to Maine, some 350 strong, congregated in Washington, D. C., June 21 for the twenty-sixth fuel engineering conference sponsored by Appalachian Coals, Inc.

Heading the list of distinguished speakers who participated in the program was Assistant Secretary of War Louis A. Johnson, who presented the principal talk at the banquet. Addressing the assemblage on the subject "Coal and Security," Mr. Johnson presented a forceful and frank exposition of the crucial situation facing the United States, and stressed the vital importance of the coal industry in meeting the greatly enlarged power demands of the swift-moving defense program. His address is carried in full elsewhere in this issue. Other talks at the dinner were given by Mayor James Garfield Stewart of Cincinnati, and Harrison E. Howe, editor of *Industrial and Engineering Chemistry*, who spoke on "Science in the New Competition." R. E. Howe, president of Appalachian Coals, Inc., was toastmaster.

Introductory talks preceding the technical sessions during the day were made by C. C. Dickinson, president of National Coal Association, who welcomed the guests, and by J. E. Tobey, vice president of Appalachian Coals, Inc., who explained to those in attendance the purpose of the Fuel Engineering Conference.

Papers presented at the sessions included the following:

"Progress in Use of Coal for Steam Generation," by E. G. Bailey, vice president of the Babcock & Wilcox Co.

"Research and Progress," by Dr. A. A. Potter, Dean of the Schools of Engineering, at Purdue University.

"Maximum Buying Under Minimum Prices," by T. W. Harris, Jr., division purchasing agent of E. I. du Pont de Nemours & Co., Inc.

"Trends in Industrial Coal-Burning," by Philip W. Swain, editor of *Power*.

"Status of Knowledge on the Properties of Coal Ash," by P. Nicholls and W. T. Reid, supervising engineer and associate fuel engineer, respectively, for U. S. Bureau of Mines at Pittsburgh.

Luncheon speakers included A. R. Mumford, secretary of the fuels section, American Society of Mechanical Engineers.

Republic Completes Electric Cap Lamp Installation

Republic Steel Corporation has completed the installation of M. S. A. electric cap lamps at its underground iron mines, including the Ironton at Bessemer, Mich.; the Penokee mines at Ironwood, Mich.; and the Cambria-Jackson mine at Negaunee, Mich.

Encouraging Outlook for Finding Domestic Strategic Minerals

With the national defense program swinging into action, the Bureau of Mines recently reported to Secretary of the Interior Harold L. Ickes on results of the first nine months of the strategic minerals survey being conducted jointly by it and the Geological Survey.

Although the United States is far from self-sufficient in strategic minerals, the general outlook for locating important domestic deposits is definitely more encouraging than anticipated at the start of the search. Dr. R. R. Sayers, Acting Director of the Bureau of Mines, said that the situation with regard to five minerals—essential in peace and critical in war—is somewhat promising. These minerals are manganese, chromite, tungsten, mercury and antimony. The nickel situation, he said, is less encouraging and results in tin are classed as rather negative.

The importance of locating and developing useful deposits of the major strategic minerals is shown by the heavy percentages of these minerals which must be imported at the present time. The following table, according to the Bureau of Mines, shows the percentage of the nation's peacetime requirements produced from domestic mines during a recent five-year period:

Manganese	5-6 %
Chromium	1 %
Mercury	40 %
Tungsten	50 %
Nickel	.5%
Tin	.2%
Antimony	10 %

Field examinations have been made during the survey of 162 deposits of strategic minerals brought to the attention of the Bureau of Mines from various sources. Of these, 33 are considered to be of sufficient interest, from the viewpoint of constituting possible strategic reserves, to warrant some exploratory work involving sampling by trenching, tunneling, test-pitting or diamond drilling, or by a combination of these methods. In addition, about 250 deposits, among several times that number on which some information has been obtained, are considered to be of enough interest to warrant preliminary examination.

Actual exploratory work has been conducted by the Bureau on nine different projects, of which one is an antimony deposit in Idaho, three are chromite deposits in Montana, Wyoming and Oregon, one is manganese in Washington, one nickel in Nevada, two tin in South Dakota and New Mexico, and one tungsten in Nevada. The results have been sufficiently encouraging to warrant further work on six of these projects, and on four of them this further work is now being done or is being planned. This exploratory work is being conducted by a staff of mining engineers under the supervision of Charles F. Jackson, chief of the Bureau's mining division.

In all of the projects examined by the Bureau of Mines some new ore bodies were found, though they were not generally of commercial grade. It is pointed out, however, that for availability as strategic reserves it is not essential that deposits be of commercial grade.

On manganese, the most important of the strategic minerals, mainly because of its vital role in the making of steel, actual exploratory work was done only in one locality, for the reason that there were so many manganese deposits to be considered that the most promising ones could not be selected immediately. It has now been possible to select from the manganese deposits considered 47 that warrant exploratory work, and during the next fiscal year it is proposed to give precedence to exploration of this class of deposit. The nation's reserves of low-grade manganese deposits are large; the problem being the devising of metallurgical processes that may make some of these low-grade reserves available for strategic demand.

One small lens of high-grade manganese ore was discovered which will not add to the strategic reserves, because it is of such grade and quality that it probably will be quickly mined out and the ore sold at a profit. Of interest, however, is the fact that the drilling cost was only about $1 per ton of ore indicated, the value of which is $30 per ton or more at prevailing prices.

Imports of manganese ore in the past have been mainly from Russia, Cuba, the African Gold Coast and Brazil.

Extensive deposits of chromite of a grade that could probably be used in an emergency are indicated in one locality. Further exploratory work by trenching and diamond drilling was to be resumed early in June for the purpose of definitely proving the existence of sufficient tonnage to be of real strategic importance. Metallurgical investigations on this ore, which is not up to standard grade, indicate that a high-grade ferrochrome product can be made, though at a cost somewhat above the normal price of this alloy. Chromite has various important chemical uses and is also used as a refractory. Ferrochrome is used in making special varieties of steel. Imports have been largely from Southern Rhodesia, Union of South Africa, Philippine Islands, Turkey and New Caledonia.

A large low-grade deposit of antimony ore has been indicated by diamond drilling. Although sub-commercial in grade, this deposit could furnish a substantial percentage of our requirements in an emergency at a price considerably above the prevailing one. Some high-grade antimony ore has been discovered occurring in small lenses and it is believed that, in the general area in which they occur, there are enough of these small deposits that in the aggregate they would constitute an important reserve. For military purposes, antimony combined with lead is used to make bullets. Antimonial lead is used as type and bearing metals. The greater part of our antimony imports prior to 1931 came from China; since that date Mexico has become the principal source of imports.

The outlook for the United States becoming self-sufficient in tungsten is very good, largely as the result of the efforts of private enterprise. The greatest use of tungsten is in making high-speed tool steel.

In the case of mercury, the prevailing high price has stimulated production from lower-grade domestic deposits the last few months to a production rate equal to the requirements of industry, although the length of time this rate of production can be continued is problematical. Mercury is used in the manufacture of fulminate, for detonating high explosives and fixed ammunition, for gold recovery by amalgamation, in drugs, dental amalgam, and for other purposes.

Two or three nickel-bearing deposits were discovered that are of sufficient promise to warrant exploratory work and sampling. Nickel is largely used in the production of alloy steel and in the making of various important alloys. The great bulk of production is from Canadian deposits.

As in the past, tin reserves have not been evidenced. It would be impossible to produce any large amount of tin even from the low-grade ores

found. One small ore shoot was partially delineated to a depth of about 300 ft. and found to contain enough tin so that it could be worked at prices about double the prevailing market price. There might be a considerable amount of similar material at depths below that which was prospected. The United States normally consumes about 75,000 tons of metallic tin or half of the world's supply. Of this, about 40 percent is used in making tin-plate, 30 percent as solder and bearing-metals, and the remainder as foil and in miscellaneous ways. In recent years, about 75 percent of the world's supply of tin has been derived from placer deposits in the Malay States and the Dutch East Indies.

In selecting deposits for investigation, the Bureau of Mines consults with the Geological Survey, and during the progress of exploratory work the Survey will cooperate with the Bureau of Mines by observing disclosures made on each project and aiding in the interpretation of them.

The Procurement Division of the Treasury Department, Washington, D. C., is the agency authorized to make all purchases of minerals, metals and other strategic materials required by the Government.

Mining and Milling at Yellow Aster

Open-cut mining, milling and cyaniding methods and costs at the Yellow Aster gold mine, Randsburg, Calif., are described in I. C. 7096 by A. W. Frolli, just published by the Bureau of Mines, U. S. Department of the Interior. The paper is presented primarily to show methods and costs of mining and treating low-grade gold ore on a large scale.

The Yellow Aster mine, mill and cyanide plant are at Randsburg, Kern County, California, 42 miles northeast of Mojave and 11 miles from Searles, the nearest railroad station. Most of the supplies are hauled 147 miles by truck from Los Angeles.

The property lies at the northeast end of the Rand Mountain at an altitude of about 4,000 feet. A semi-arid climate permits operation without difficulty all year.

Gold was first discovered in 1895 near the present glory hole. From the time of discovery until 1905, ore was mined from the vein system by open stopes with pillars, by stull stoping, and by square-set stopes. From 1905 to 1918, mining was done by the glory-hole method of mining. The mine was closed in 1918 and was run intermittently from that date until 1933, when the property was taken over by the Anglo-American Mining Corporation, Ltd.

Although the gold occurs mainly in the granites, minor deposits have been found in the schists. Three main types of ore bodies are found: (1) Deposits along fault zones, (2) stockworks in granites, and (3) fissure veins. The gold is generally free but is accompanied by a little pyrite, arsenopyrite and some scheelite.

From 1895 to May 1, 1939, the records show that slightly more than 3,400,000 tons of ore were milled which yielded about 500,000 ounces of gold valued at $12,000,000. Virtually all of the gold was recovered by amalgamation with only a minor amount recovered by flotation.

Impounded and current mill tailings treated by cyanidation to date amount to 1,700,000 tons with 41,000 ounces of gold recovered.

The mine has been developed to a depth of 800 feet from the highest point of the outcrop and by about 15 miles of adits, shafts, drifts, crosscuts, raises and winzes.

Open-pit mining with power shovels and truck haulage was adopted by the present company, and mining is done on contract.

Conditions are favorable for low drilling and blasting costs and for hauling, as the floor of the pit is on a level with the top of the crushing plant. From November, 1938, to January, 1939, inclusive, 249,747 tons of ore and 6,790 tons of waste were mined at an average cost of $0.1876 per ton.

Of the 249,747 tons crushed, 31.4 percent was sent to the mill bin and 68.6 was discarded as waste. Based on these figures 78,420 tons were treated as ore with a mining and milling cost of $1.1511 per ton of ore milled, mining costs $.5975 and milling costs $.5536.

From November, 1938, to January, 1939, 78,700 tons of tailings were worked by hydraulic mining at a cost of $0.0555 per ton, milling cost $0.2437, making an average cost for mining and cyanidation $0.3092 per ton of tailings treated.

Milling comprises a combination of amalgamation and cyanidation which are described in detail in the circular.

Carlton Tunnel Passes Half-Way Mark Year Ahead of Schedule

An all-time world record for tunnel driving was established in June when the six-mile-long Carlton drainage tunnel, now being built in the Cripple Creek district of Colorado, passed the half-way mark. Work on the tunnel which is the biggest underground project in American mining today was started July 13, 1939. The original time estimated to complete the bore was approximately four years but it is now believed that the main tunnel can be completed in two years or less.

Highly efficient organization is given credit for having produced the driving speed in building the Carlton tunnel. Herewith are some of the methods used in attaining that high degree of efficiency which is attracting the attention of the entire mining world.

The Carlton drainage tunnel is being constructed and financed in its entirety by the Golden Cycle Corporation of Colorado Springs of which Merrill E. Shoup is president. A. H. Bebee, vice president in charge of the corporation's many mining activities in the Cripple Creek district, has direct supervision of the tunnel project with John R. Austin, tunnel superintendent.

The Golden Cycle Corporation has allotted $1,000,000 for the project which is being built entirely without government aid.

"We should be able to complete the tunnel, with our record-breaking progress, for much less than $1,000,000," said Vice President Bebee. "However, our costs for bits, powder and maintenance are higher than was originally anticipated. The exceptionally hard rock encountered accounts for the higher powder costs, and the relentless speed with which the heading crews are pushing the machines and equipment naturally imposes a greater strain on them."

The Carlton tunnel, which is the third to be driven exclusively for drainage purposes in the Cripple Creek district, will unwater the gold mines to a level of an additional 1,140 feet below the level of the old Roosevelt drainage tunnel—driven more than 20 years ago—and will open up a new area of 30 square miles to profitable mining of gold bearing ore.

Ten by eleven feet in cross section with a 4-foot, 6-inch radius arch and a 0.3 percent water grade, the Carlton tunnel is being driven through at least 25,000 feet of exceptionally hard and tough Pikes Peak granite. It is believed that no timbering will be required except that used for the first 200 feet, which was driven through highly fractured surface rock. Sometime after the 25,000 mark is reached the tunnel will tap the famed Cripple Creek crater, consisting mainly of breccia. Few, if any, water veins should be encountered until after the bore penetrates the crater.

Three factors have contributed to the record breaking progress made in driving the Carlton tunnel.

"One of these is the efficiency with which the crews and the work cycle have been organized by Superintendent Austin," Mr. Bebee says. "Other factors include the most efficient mechanized equipment we can obtain and our bonus system for the heading crews. The progress we have made would not have been possible had it not been for the loyalty and cooperation of each man on the job and the friendly rivalry of the three shifts to break each others record."

The wage scale for the heading crews is based on 300 feet of progress per month per shift. For more than 300 feet the company pays a bonus of $4 per foot, pro-rated among the crew according to each member's base pay.

Drilling is done by a 2-foot jumbo with five Type DA-35-3½-inch Ingersoll-Rand drifters mounted on the head. An additional drifter is mounted on the side for drilling and slabbing stations. The weight of the jumbo is about five tons without drills or steels, and was built in the Cresson mine shop. A complete round of steel and bits is carried on the jumbo, as well as two spare drifters. When moving to and from the face, the drifters and columns are folded back parallel to the tunnel to clear the frame of the "cherry picker." The method of mounting the drifters eliminates need of jacking the columns to the bottom and sides of the tunnel.

Conventional steel was first used, but tests were started later on the

use of detachable bits with the result that Timken bits have been adopted as standard. Recently the size of the starting bit was reduced from 2⅛ inches to 1⅞ inches. This resulted in increasing the drilling speed 25 percent and breaking the ground faster. The hole is finished 1⅝ inches. A peculiar characteristic of the hard rock now being encountered is that the cutting edge becomes dulled long before the bit loses gauge.

When using conventional drill steel, four men were required to maintain an adequate supply. Since changing to detachable bits, two men, grinding approximately 900 bits per 8-hour shift on a Massco Model 38 Grinder, have been able to keep pace with the demand of the heading crews. After each 2-foot run, the bits are ground to a slightly rounded wing point without regard to size. They are then sorted and put into bins of the nearest 1/16-inch gauge. Drill sets are made up to have a ⅛-inch difference in gauge. As most bits reach the discard size of dulled 1 9/16 inches before any softness is observed, retempering has not been found necessary. About six regrinds are being obtained on each bit.

Switching of the loaded muck cars is done by a "cherry picker" method developed by Superintendent Austin. Air-operated, the "cherry picker" lifts an empty car above the track high enough to permit the muck train to pull the loaded cars underneath. The empty car is lowered and the muck train pushes it to position behind the mucker. As the muck train goes back to the face, a second locomotive pushes another empty into position to be lifted by the "picker." This second locomotive then proceeds to the face to serve as a helper in pulling back the loaded cars.

Uranium Recovery at Uravan

The new uranium concentration plant of the U. S. Vanadium Corporation at Uravan, Colo., is expected to be operating at an early date. The plant, estimated to cost about $100,000, will treat 50 tons per day, recovering values of uranium from the tailings from the vanadium plant which handles 250 tons per day. The vanadium plant has been operating successfully for over three years. John R. Van Fleet, 30 East 42nd St., New York City, is vice president and general manager, and Blair Burwell and W. G. Haldane are manager and superintendent, respectively, at Uravan.

Field Work of U. S. Geological Survey

The summer schedule for field work by geologists of the U. S. Geological Survey, already under way or soon to begin, includes the following projects:

Studies of Pleistocene deposits and of faulting of the intermontane basins, mainly in that part of Montana west of Butte, by J. T. Pardee; attention will also be given to manganese in the Philipsburg district in connection with drilling of the deposits by the Bureau of Mines, under the strategic minerals program.

An examination of the Ivanhoe mercury district, near Winnemucca, Nev., by R. J. Roberts.

A study of the Coso quicksilver district, Inyo County, Calif., by C. P. Ross, who later in the summer will probably make examinations of mercury districts in southeastern Oregon and adjacent parts of Nevada, including the Bretz and Opalite properties in Oregon and the Cordero property in Nevada, in addition to prospects on and south of Steens Mountain, Oreg.

An extension by Eugene Callaghan of the ariel map previously prepared by him of the Marysvale alunite region, southwest-central Utah.

Resumption of a study of the geology and mineral deposits of the Irwin quadrangle, Idaho-Wyo., by L. S. Gardner.

A study by W. C. Warren of the stratigraphy and structure of the Forks area on the west slope of the Olympic Mountains, Wash., with special attention to its petroleum possibilities.

Field examination of the coal lands in southwestern Powder River County, Mont., by R. P. Bryson.

Continuation of field work on the west side of the Big Horn Basin, Wyo., by W. G. Pierce, who plans to extend westward the mapping in Sunlight Basin to include the remainder of the sedimentary rocks not covered by volcanics, and to extend mapping of the Heart Mountain thrust northwestward up Clark Fork Valley.

An investigation of the stratigraphy and fuel resources of the Durango and Red Mesa quadrangles, Colo., by C. H. Dane.

Continuation of the examination by A. A. Baker of the geology and mineral resources of the Wasatch Mountains-Strawberry Valley region east of Provo, Utah.

Continued investigation of the tin resources of the York region, western Seward Peninsula, Alaska, by J. B. Mertie, Jr.

Geologic investigations in several Alaskan areas, including portions of the Copper River, upper Yukon and Juneau districts, by J. S. Williams.

An investigation of the chromite deposits of southwestern Kenai Peninsula, Alaska, by P. W. Guild.

Coal Division Consolidates Field Work into Five Offices

Secretary of the Interior Harold L. Ickes has announced that the Bituminous Coal Division's field compliance work under minimum prices soon to be established would be carried on by five of the Division's 11 field officers. To meet a $137,800 budget reduction ordered by Congress, the Division will have to close its remaining six field offices, transfer their work either to Washington or to other field offices and make other economies and shifts in work. Congress cut the Division's appropriation to $2,250,000 from the $2,387,800 requested by the Bureau of the Budget.

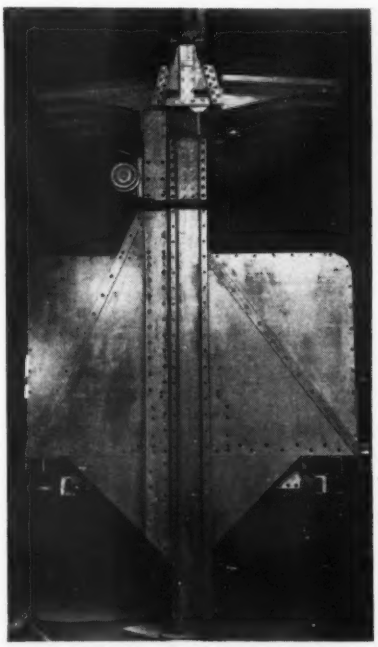
The field offices to be retained are located in Pittsburgh, Bluefield, Ashland, Chicago and Denver; those to be closed are in Altoona, Cleveland, Fairmont, Birmingham, Indianapolis and Kansas City.

The minimum prices will cover substantially all of the commercial coal produced in the United States. In addition to this there will be the compliance work not heretofore carried on to the extent necessary after prices are established.

All of the statistical work dealing with costs of production now handled in field offices will be done in the Washington office, while the remaining five field offices will deal with sale and distribution statistics and compliance work.

Director Gray reported to Secretary Ickes that the Division would be able to meet its compliance requirements under established minimum prices despite the budget reduction by closing of the field bureaus, consolidating work and reducing the number of employes now engaged in management and statistical work. Orders have been issued to carry out the shifts and economies.

Work now performed at Altoona, Fairmont and Cleveland will be consolidated with that of the field office in Pittsburgh, and the Division's offices will be retained at that place. Work now done at Birmingham will be moved to Bluefield, W. Va., and



Self-dumping mine skip built of Mayari R high strength, corrosion resisting steel. Weight of skip 15,700 lbs. compared with 21,000 lbs. for a skip of similar capacity made of ordinary steel. Savings in dead weight thus amounts to 5,300 lbs. or more than 25 percent

consolidated with the office there. The offices at Indianapolis and Kansas City will be moved to Chicago and consolidated with the work now done there. That will leave no change in the offices in Ashland and Denver except for the cost work removed to Washington. Where additions to the staff at Pittsburgh, Bluefield and Chicago will be necessary to handle the increase in management and statistical work caused by the consolidations, personnel will be transferred from the abolished offices.

Director Gray has also issued an order denying an application of the Receivers of the Seaboard Air Line Railroad Company for exemption of coal used by the railroad from the minimum price and market regulatory provisions of the Bituminous Coal Act.

The Division soon will establish minimum prices to put a "cost floor" under prices at the mine for substantially all of the coal produced in the United States.

The receivers of the railroad company sought exemption from minimum prices and other regulation under the Coal Act under a section of the law which exempts coal consumed by the producer. They contended that they were the producers of the coal mined by independent contractors from lands leased by the railroad. The contractors were supplying from 40 to 50 percent of the railroad's coal needs as of 1936.

"Having due regard for all relevant facts, it seems to me that the Seaboard Receivers are not 'engaged in the business of mining' the coal extracted from the leased mines," the director said in his opinion accompanying the order.

He added that it was a reasonable inference that the receivers of the railroad company were trying to use a "flexible contrivance" in hope of establishing themselves as the normal producer of the coal used by the railroad "and thereby escape the price provisions of coal legislation, including the Act."

He cited as particularly noteworthy in that respect a provision in the contracts between the railroad and the mine contractors which permit termination of the contracts if the contractors do not reduce their compensation sufficient to meet the market price of coal. He pointed to "inordinately short term extensions" of the contracts while litigation challenging the constitutionality of the first Coal Act was pending in 1935, and while Congress was considering reenactment of the Coal Act in 1936.

The director found that the Seaboard receivers have not assumed such of the normal burdens and risks of the business of mining coal as to justify the conclusion that the receivers were in that business. He pointed out that the contractors had incurred the responsibilities and liabilities for production of the coal, and that they performed the actual work of coal mining, in which the receivers do not participate.

"The transaction," he said, "has the aspects of an ordinary commercial sale and, indeed, it appears that applicants (Seaboard receivers) stand in a position not materially different from that of any large consumer who dominates a small source of supply or who has contracted for the total product of a given manufacturing enterprise or tract of land.

"In every real sense, with respect to the supply of coal obtained from these contractors, applicants have not become a 'producer' but have rather left their 'consumer' position and mobility unchanged. This mobility is demonstrated quite pointedly by the contract provisions permitting applicants to terminate the contract if they can obtain coal in the open market at a lower price than under the present arrangement, provided that the contractors do not reduce their compensation sufficient to meet the market price. The leases (on the coal lands) are terminable upon termination of the contracts."

In mid-June an order was issued by the Division granting provisional approval to Brazil Block Fuels, Inc., Terre Haute, Ind., as a regional marketing agency.

As a marketing agency, Brazil Block Fuels, Inc., proposes to enter into agreements with mining companies which become members of the agency to serve as their exclusive sales agency for all rail-distributed coals sold by them throughout the Midwest. It has the power to fix the prices at which the coals are sold, except that no coal may be sold at prices less than the minimums established by the Bituminous Coal Division without incurring penalties provided by the Bituminous Coal Act.

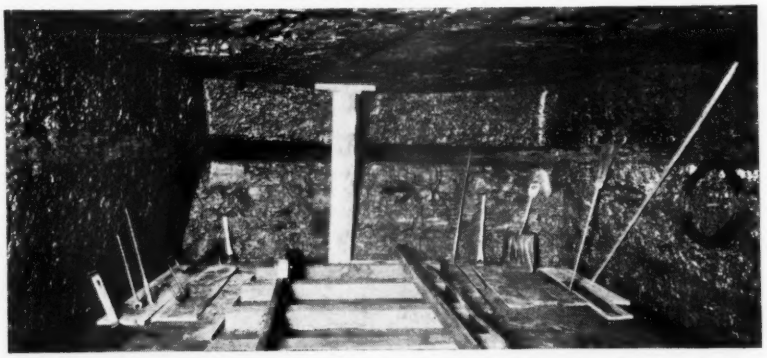
The agency's contracts provide that mining companies who become members can sell no rail-delivered coal except upon the order and with the direction of Brazil Block Fuels, Inc. However, whenever the agency fails to sell enough of a member mine's coal to permit the mine to be operated satisfactorily, the member, after giving 15 days' notice, can set its own price for the coal.

When the application for approval was filed with the Division, in August, 1939, the agency stated that eight of the 15 mines in the Brazil Block field with railroad connections had agreed to become members. One additional mine originally had agreed to join, but withdrew. The application stated that the mines proposing to become members produced approximately 5 percent of the coal mined in the state of Indiana, but about 75 percent of that mined in the Brazil Block field. The mines are located in Clay, Owen, Parke, Spencer and Vigo Counties, and market their coal in Indiana, Illinois, Missouri, Iowa, Minnesota, Wisconsin, Michigan, North and South Dakota.

Under the Division's provisional approval, the agency must begin to function within 90 days. All members of the agency are required by law to be members of the Bituminous Coal Code, and the agency as well as its members must observe effective minimum and maximum prices, marketing regulations and all other orders issued by the Division. All contracts and agreements entered into by the agency are subject to review by the Division.

The Division may establish maximum prices and marketing regulations for coal sold by the agency whenever it has reason to believe that the activities of the agency are tending to restrict unreasonably the supply of coal in interstate commerce, or to prevent the public from receiving coal at fair and reasonable prices, or are operating against the public interest in any market area.

On June 6 the Division concluded hearings on exceptions to minimum 'at the mine" prices recommended by examiners, following appearances of three-fourths of the producers' boards and about 150 individual producers and consumers opposing these recommendations. Generally speaking, the complaints were that prices were too high in particular areas in view of completion which must be met, and price changes were requested on this basis. These are now being reviewed by the Division, with staff members driving hard to promulgate minimum prices at an early date.



Model working room in a mine of Consolidation Coal Company—developed and arranged to instruct newly employed men in the use of various tools and best methods to insure production of clean "Cavalier" coal

Montana Mines Graduates Get Jobs

Ninety percent employed within a week of their graduation, in the professions for which they prepared, is the phenomenal record of the class of 1940 at Montana School of Mines, according to O. A. Dingman, Associate Professor of Mining Engineering, chairman of the faculty employment committee.

Professor Dingman admits that the placing of the 50 young engineers, the largest class in the history of the institution, loomed as a big task early this spring, but weeks before commencement the problem was practically solved—"35 of them had jobs before they got their sheepskins, and requests from employers are still being received. 'The men you have recommended before have all made good and we would like you to select another one for us,' said one recent unsolicited letter from an adjoining state."

"Distribution of jobs to which our men have gone is equally significant—30 are employed in Montana, six have jobs in the Canadian gold fields, one in an eastern Canadian mining school, and another in a leading Massachusetts institution. One has gone to British Columbia, three to New Jersey, one to Texas, one to California, one to Chicago, and one to Utah. One has gone to aid in exploiting the mineral resources of far-off Liberia, but in the main our boys have rather turned up their noses at foreign service, and quite a few openings in South America have been passed up."

Professor Dingman is confident that the balance of the class will be placed in the next few weeks and that before mid-summer the entire group will be serving the mineral industry in various professional or semi-professional capacities.

Coal Conference Dates Set

The fourth annual coal conference at West Virginia University will be held October 18 and 19 at Morgantown. The coal conference this year will be jointly sponsored by the School of Mines at West Virginia University and the West Virginia Coal Mining Institute. A program committee appointed by Mr. C. W. Connor of Nellis, president of the Institute, includes W. E. E. Koepler, secretary of the Pocahontas Operators Association at Bluefield; Jesse V. Sullivan, secretary of the West Virginia Coal Association, and D. L. McElroy, director of the School of Mines at West Virginia University. This committee has already made arrangements for a number of papers on subjects of value and interest to the coal industry by experts in various fields of work.

In addition to the coal conference, the West Virginia Society of Professional Engineers, of which Mr. M. L. O'Neal of Huntington is president, and Mr. Robert Williamson, Jr., of Charleston is secretary, are holding their annual meeting at Morgantown on October 17, 18, and 19. The meetings of the West Virginia Society of Professional Engineers and the coal conference will be jointly held on Friday and Saturday, the 18th and 19th. This is an added feature of the meeting and will bring together these groups which have many problems in common.

PUBLICATIONS OF INTEREST

U. S. BUREAU OF MINES

T. P. 596. Carbonizing Properties and Petrographic Composition of Pond Creek Bed Coal from Majestic Mine, Majestic Pike County, Ky., by A. C. Fieldner, J. D. Davis, W. A. Selvig, D. A. Reynolds, G. C. Sprunk and H. S. Auvil. 46 pp. 28 figs. 10 cents.

T. P. 597. Physical and Chemical Properties of Cokes Made or Used in Washington, by H. F. Yancey, R. E. Zane, R. W. Fatzinger and F. A. Key. 44 pp. 16 figs. 10 cents.

T. P. 599. Carbonizing Properties and Petrographic Composition of High Splint Bed Coal from Closplint Mine, Closplint, Harlan County, Ky., by A. C. Fieldner, J. D. Davis, D. A. Reynolds, W. A. Selvig, G. C. Sprunk and H. S. Auvil. 38 pp. 25 figs. 10 cents.

T. P. 601. Carbonizing Properties and Petrographic Composition of Sewell Bed Coal from Wyoming Mine, Wyoming County, W. Va., and the Effect of Blending this Coal with Alma Bed Coal, by A. C. Fieldner, J. D. Davis, W. A. Selvig, R. E. Brewer, C. R. Holmes, D. A. Reynolds and G. C. Sprunk. 45 pp. 25 figs. 10 cents.

T. P. 606. Production of Explosives in the United States During the Calendar Year 1938, by W. W. Adams, V. E. Wrenn and L. S. Horton. 28 pp. 2 figs. 5 cents.

R. I. 3457. Friability, Slacking Characteristics, and Low-Temperature Carbonization Assays of Subbituminous Coals of the Denver (Colo.) Region, by V. F. Parry and John B. Goodman. 12 pp. 3 figs.

R. I. 3458. Washability Studies of the America and Pratt Coal Beds at Gorgas, Ala., by B. W. Gandrud and G. D. Coe. 12 pp. 19 figs.

R. I. 3462. Notes on Large-Scale Tests of the Explosibility of Coal Dusts Made in the United States and Great Britain, by H. P. Greenwald. 9 pp. 4 figs.

MISCELLANEOUS

Bibliography of the Geology and Mineral Resources of Arizona, by Eldred D. Wilson, Arizona Bureau of Mines, Geological Series No. 13, Bulletin No. 146. 164 pp. 35 cents.

Proceedings Rocky Mountain Coal Mining Institute, 1939. 110 pp.

Petroleum and Natural-Gas Production—WPA National Research Project. 346 pp. 30 figs.

Effect of Preparation on Ash Fusibility of Selected Illinois Coals—Report of Investigations, No. 55. By L. C. McCabe and O. W. Rees. 30 pp. 10 figs.

Colorado Scientific Society Proceedings—Geology and Ore Deposits of the Magnolia Mining District and Adjacent Area, Boulder County, Colo., by Albert S. Wilkerson. Vol. 14, No. 3. 101 pp. 10 figs. 50 cents.

Forty-First Annual Report of the Mining Industry of Idaho—1939, by Arthur Campbell, Inspector of Mines, Boise, Idaho. 333 pp.

Directory of Mineral Producers for 1938 (California Mineral Production), by Walter W. Bradley, State Mineralogist, Division of Mines, San Francisco, Bull. No. 117. 209 pp.

The Labor Act—Is It Tolerable? A Practical View of the National Labor Relations Act and Its Administration, by Thomas H. Slusser, Wisconsin Cuneo Press, Inc., Milwaukee, Wis. 100 pp. $1.

Geology and Mineral Deposits of Bridge River Mining Camp, British Columbia, by C. E. Cairnes, Canada Geological Survey Memoir 213. 140 pp. 6 plates. 5 figs. 50 cents.

How to Buy, Sell and Burn Coal, by Thomas A. Marsh. 97 pp. $1.00.

The Northern Lakes States Region, by National Resources Committee. 35 pp.

Investigations in Ore Dressing and Metallurgy (January to June, 1938). Mines and Geology Branch, Canada Bureau of Mines. 147 pp. 50 cents.

Nickel Deposits in Cottonwood Canyon, Churchill County, Nevada, by H. G. Ferguson, Geologist, U. S. Geological Survey, U. of Nevada Bull., Geol. & Mining Series No. 32. 23 pp. 4 figs. 25 cents.

Geology and Geography of Northampton County, Pennsylvania, by Benjamin LeRoy Miller, Donald McCoy Fraser and Ralph LeRoy Miller. 496 pp. 29 plates. 36 figs.

Colorado Scientific Society Proceedings—Geologic Map of the Front Range Mineral Belt, Colorado, by T. S. Lovering and E. N. Goddard. Vol. 14, No. 1. 48 pp. 4 figs. $1.00 per copy.

Colorado Scientific Society Proceedings—Preliminary Geological Report on the West Slope of the Mosquito Range in the Vicinity of Leadville, Colo., by C. H. Behre, Jr. Vol. 14, No. 2. 79 pp. 3 figs. By T. S. Lovering and E. N. Goddard.

Illinois Mineral Industry in 1938—A Preliminary Statistical Summary and Economic Review, by Walter H. Voskuil and G. N. Oliver. Report of Investigations, No. 56. 23 pp. 3 figs.

Seven Talks About Mines—Issued by the Butte Chamber of Commerce. 62 pp. May be obtained free of charge.

Scenery of Florida (Interpreted by a Geologist)—By C. Wythe Cooke, Ph.D. Geologist, U. S. Geological Survey. Florida Geological Bulletin No. 17. 118 pp. 58 figs.

The Mineral Resources of Montana—Their Past Production and Future Possibilities. By State Bureau of Mines & Geology and Mineral Resources Division and State Planning Board. Issued by Montana Mining Assn., Montanans, Inc. 7 pp.

Geology and Ore Deposits of the Atlanta District, Elmore County, Idaho, by Alfred L. Anderson, Idaho Bur. Mines & Geol. Pamphlet No. 49. 71 pp. 6 plates. 7 figs.

The Wage and Hour Law, by Paul H. Sanders, School of Law, Duke University, Vol. VI, No. 3. 170 pp. 75 cents.

Geology And Allied Sciences—A Thesaurus and a Coordination of English and German Specific and General Terms, by Wolther Huebner. Part I. German-English. Veritas Press, New York, 1939. $7.50.

PERSONALS

Moss Patterson has been appointed chief mine inspector and head of the Kentucky Department of Mines and Minerals, succeeding **John F. Daniel**, resigned. Patterson has been a Harlan and Bell County mine superintendent for the past 15 years, and is now mining engineer for the Asher Coal Company.

C. K. Leith, professor of geology at the University of Wisconsin and recently appointed assistant on the National Defense Committee handling mineral raw materials, was conferred the degree of Doctor of Science by Columbia University at its commencement exercises.

Wendell V. Richards, former federal sales supervisor, has been promoted to federal representative in Washington, D. C., for R. G. LeTourneau, Inc. He succeeds **Stanley P. Means**, who has taken over the position of manager of the sales training division with headquarters in Peoria, Ill. **George W. Lokey, Jr.**, assistant field engineer, has filled the position of federal sales supervisor vacated by Mr. Richards.

Frank P. Blancett has been appointed sales representative for the Diamond Iron Works, Inc., of Minneapolis, Minn., covering dealer representation in stone, sand and gravel equipment for the States of Arizona, New Mexico, Texas, Oklahoma, Arkansas and Louisiana. His headquarters will be at the Clifton Hotel, in Dallas, Tex.

George McNutt has returned to R. G. LeTourneau, Inc., as advertising manager, filling the position vacated by **George R. Huffman.**

Dr. Howard A. Smith, until recently research metallurgist with the Rustless Iron & Steel Company, Baltimore, Md., and previously in charge of stainless steel developments in the laboratories of Republic Steel Company at Canton, Ohio, has been made chief metallurgist of The Duraloy Company, Scottdale, Pa.

John Korpita, a student from Dakota in the mining extension classes of West Virginia School of Mines, was the winner of a flame safety lamp awarded by **D. L. McElroy**, director of the school, to the student making the best record in the mining extension classes during the 1939-40 school year.

W. H. Schacht, president and general manager of Copper Range Company, and **J. V. N. Dorr**, president of the Dorr Company, were conferred honorary degrees of doctor of engineering at the fifty-third annual commencement exercises of the Michigan College of Mining & Technology, held June 7 at Houghton, Mich.

James C. Gray has been made chief inspector of the coal mines division of Tennessee Coal, Iron & Railroad Company, succeeding **Angus R. Brown**, promoted. Mr. Gray was heretofore superintendent at the company's Wylam mine.

Games Slayter, vice president of Owens-Corning Fiberglas Corp., was awarded an Edward Longstreth medal by the Franklin Institute at its annual Medal Day exercises. The medal was given "in recognition of meritorious work in science and the industrial arts," on the recommendation of the Institute's Committee on Science and the Arts, according to Dr. Henry B. Allen, secretary and director of the Institute. Mr. Slayter is in charge of research and development for his company, and at least eight principal United States patents in the fiberglas field have been issued in his name.

Ray Ellis, director of the mine rescue division of the State Department of Mines in five southern West Virginia counties, recently resigned that position to accept an offer to become safety engineer for the Pond Creek Pocahontas Company at Bartley, W. Va.

Senator Key Pittman of Nevada was the principal speaker at the commencement exercises held by Montana School of Mines at Butte, May 31.

James H. Critchett, vice president of Electro Metallurgical Company, vice president of Union Carbide and Carbon Research Laboratories, Inc., and former president of the American Electro Chemical Society, has been appointed a member of the National Research Council. Mr. Critchett will serve on the Division of Chemistry and Chemical Technology.

W. O. Hotchkiss, president of Rensalear Polytechnic Institute, was recently awarded the honorary degree of Doctor of Science by Columbia University in New York City.

J. F. Caulfield has been elected president and a director of the Elk Horn Coal Corporation, succeeding the late **Senator C. W. Watson.** Mr. Caulfield has been identified with the coal industry since 1902, having been associated with the Consolidation Coal Company for eight years previous to his joining the Elk Horn Fuel Company and Elk Horn Coal Corporation.

Edgar C. Long, superintendent of the Waco properties of the St. Louis Smelting & Refining Company, has been selected to succeed **W. F. Netzeband** as statistician of the Tri-State Zinc and Lead Ore Producers' Association. Long took over his duties early in June.

Scott Turner was recently awarded the honorary degree of Doctor of Science, by Kenyon College, Gambier, Ohio.

George S. Rose has been appointed secretary of the American Iron & Steel Institute, following his association with that organization for the past six years. Previous experiences included service in metallurgical, production and sales capacities with the Alan Wood Steel Co., Crucible Steel Co. of America and American Steel & Wire Co.

B. B. Boyd, associated with the H. C. Frick Coke Co. for 35 years, has been appointed superintendent of the Maxwell and Bridgeport mines, succeeding the late **M. A. Burriss.**

Sidney Norman, mining editor of the *Globe and Mail* in Toronto, Canada, during the past three and one-half years, has resigned that position and left for his previous home in California.

—*Obituaries*—

Clarence W. Watson, president of the Elk Horn Coal Corporation, died in Cincinnati, May 24, following an operation. His age was 76.

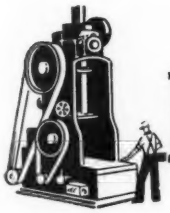
During his long and active career in the coal industry, Senator Watson was instrumental in organizing and administering such large companies as the Consolidation Coal Company and the Elk Horn Coal Corporation. In 1911 he was elected to the U. S. Senate to fill the unexpired term of Steven B. Elkins, and served until 1913.

N. C. Moore, president, Pacific Coast Coal Company, died during the third week in May.

L. H. Metzgar, superintendent of the Alaska Juneau mine, died on June 2 at San Francisco. He will be succeeded by J. A. Williams of Juneau.

Richard Bosustow, managing-director of Bralorne Mines Limited, died in Vancouver, B. C., May 17, after a lengthy illness. His age was 50 years.

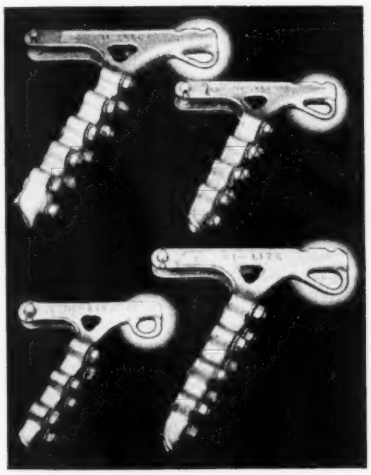
Mr. Bosustow's experience in mining dated from after the World War and covered responsible positions with the American Metal Company in Mexico and at Shafter, Tex. In 1931 he was made general manager of Bralorne Mines Limited and later managing-director, during which he brought this property to its position as one of the most successful precious metal mines in western Canada.



MANUFACTURERS' Forum

Stringing Loops Added to Strain Clamps

To simplify the job of dead-ending conductors, the Ohio Brass Company, Mansfield, Ohio, has added a stringing loop under the nose of three of its strain clamps, known as the Hi-Lites. This loop makes it possible to attach the "blocks" for securing proper conductor tension directly in the clamp. When the tail block is hooked in the new loop and the conductor is brought to tension, the entire dead-end assembly assumes a position that is practically a continuation of the con-

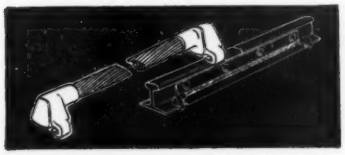


ductor. Thus, it is not necessary to compensate for slack wire between the come-along and clamp as required when the tail block is held by a sling placed around the pole or crossarm.

In addition to simplifying the procedure of dead-ending, the loop permits more accurate sagging of conductors. The loop is an integral part of the clamp body casting and has ample strength for any tensions to which it may be subjected. The three clamps redesigned have conductor ranges without liners of 0.400-0.680, 0.675-0.800 and 0.790-0.930 in. respectively. A fourth clamp, having a range without liners of 0.400-0.550 in. and shown with the other three clamps in the accompanying illustration, was previously given a stringing loop.

Rail Bond

A new rail bond, designed for greater economy, has just been developed by the Mosebach Electric & Supply Co., 1152 Arlington Avenue, Pittsburgh, Pa. Designed as Type M12-F, for which patent is pending, the new bond is constructed in a minimum length, longer than the standard



fishplate, thus saving the cost of extra cable.

Flashwelding, a patented process, is used in construction of the bond. This superior welding method provides an absolute connection between the terminal and each individual strand in the copper cable, making a stronger, more oxygen-free weld for longer bond life and lower resistance.

Other outstanding features of the new bond are its extra large terminals, for greater welding area, and the fact that it is easy to install and to reclaim. The manufacturer will be pleased to furnish complete details and prices upon request.

Portable Electric Hammer

The Thor-Nado, an electric hammer featuring the radically new "Sling-Shot Drive" that delivers a blow unparalleled for power in a tool of its size and capacity, is the latest product of the Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, Ill.

Although it measures only 13½ in. long and weighs but 14 lb., this powerful new hammer is adapted to a wide variety of heavy-duty applications, including star drilling, channeling, chipping, cleaning, scaling, cutting, gouging, beading, caulking, and seaming. Its capacity in concrete, limestone, and brick is 1 in.

The outstanding feature of the new hammer is the patented "Sling-Shot Drive," a method of driving the piston in a hammer action by means of a shockproof rubber connection. This sling-shot drive whips the piston back

and forth at a speed of 1,600 blows per minute, acting as both power accumulator and shock absorber.

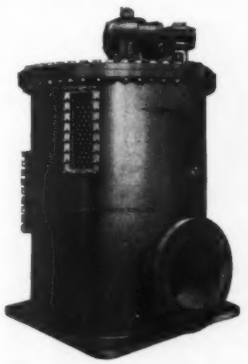
There is no metal connection between the piston and the gear train and motor. The blow of the piston is not felt by the operator nor is it transmitted to the gear or motor.

The specially designed, overcapacity, universal type motor is housed at right angles to the piston barrel and transmits power through heavy-duty helical-cut gears. Armature and commutator are both hand-wound. Ball bearings are sealed against dirt and dust.

For further information on this tool, write to the above company for Circular No. E-32.

Automatic Strainer in Coal Washing Results in Closed Water Circuit

The Brassert Automatic Strainer, when substituted for a main dewatering cone, has made possible the re-use in coal washing systems of all water passed by the strainer. Solids from



the strainer backwash are eliminated by a small dewatering screen, the water returning to the system and the coal going to product. This strainer is made by H. A. Brassert and Company, 313 South Michigan Avenue, Chicago, Ill.

Plugging Switch

In a new plugging switch for controlling motor stopping, recently introduced by the General Electric Company, the use of an Alnico magnet as its fundamental part eliminates frictional parts or clutches and contributes to low maintenance costs and long operating life. Compact design, low operating torque, and immunity to heat are other features of this switch.

In the operation of this new switch,

a driven Alnico rotor produces a rotating magnetic field which induces eddy currents in the walls of the aluminum cup. The magnetic reaction produced by the eddy currents turns the cup through its limited rotation, and the contacts are operated by the Textolite rod which connects the cup and the movable contact strip.

Centering springs tend to keep the contacts in the normal position but since the magnetic operating force on the aluminum cup is dependent on speed, contacts operate at and above a definite speed. As the speed decreases, a definite point will be reached where the spring force will overcome the magnetic force. This is the tripping point. Changing the spring tension provides a simple means of adjusting the tripping speed over a definite range. A different tripping range can be obtained by changing the springs.

Heavy-Duty Truck Bearing Packer

The need for fast and positive bearing lubrication is met by the packer

illustrated. It is an item of the Croft manufacturer and is distributed exclusively by Ahlberg Bearing Company, Chicago, and branches.

It thoroughly lubricates a large bearing in one easy operation and, at the same time, conserves grease. The unit is unconditionally guaranteed for one year, and is built to take bearings from 1½ inches ID to 7 inches OD.

Mine Car Derail

A new mine car derail, designed for increased safety against runaway cars, has recently been introduced by the Portable Lamp & Equipment Co., 77 First Avenue, Pittsburgh, Pa. Constructed to work like a switch, the device is fitted with a flange which guides the car wheel gradually, rather than suddenly, off the track. This feature eliminates danger of car wheel jumping completely over device, a common weakness in some derailing devices.

No tools are required for installing or removing the new derail, and digging under rail is unnecessary. The device is simply placed on the rail and tightened by means of a roller binding on rail head. It can be loosened and removed by kicking or driving it in the opposite direction.

The new derail is first of a series of new and improved haulage safety devices to be announced by the Portable Lamp & Equipment Co., and to be designated as Portable's track tackle line. Illustrated literature and prices are available upon request to the manufacturer.

Robins Conveying Belt Company's New Office Building

The old Park Row Building in New York, for many years the tallest building in the world, has had its upper floors and towers occupied for more than 40 years by Robins Conveying Belt Company.

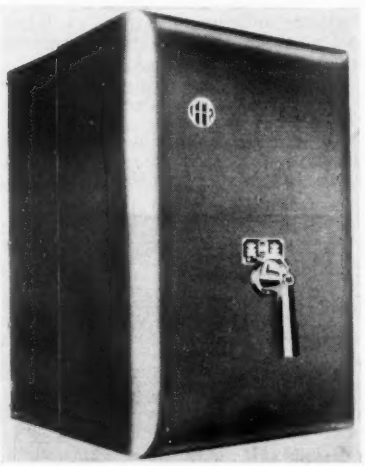
This concern, under the leadership of Thomas Robins, pioneered the belt conveyor in this country and many other countries and has through the years developed into one of the leading designers and manufacturers of material handling machinery.

The factory in which this equipment is manufactured is located at Passaic, N. J., where the company has now built a three-story brick office building to house its executive, engineering, sales and other departments, where they can be in closer touch with the manufacturing facilities to the advantage of clients, as well as themselves.

The new address, Passaic, N. J., will be effective for all correspondence with the company on May 1, 1940. A New York sales office, located at 70 Pine Street, will be maintained for the convenience of friends within the city.

New Type "K. B." Circuit Breaker

Illustrated is I-T-E Circuit Breaker Company's new 600-ampere, three-pole type K. B. Circuit Breaker mounted in an individual steel enclosure of the pull-box type. The interrupting ability of the new K. B. is such that in a dust-proof enclosure it can be rated at 20,000 R.M.S. Never before has a circuit breaker of this capacity been made as compact and with as many operating features. Available, electrically or manually operated, in ratings up to 600 amperes for open mounting or for cubicle mounting in switchgear. Bulletin 4001, recently issued, describes and further illustrates all the new features.



Resilient Pressure Pads for Holder End of Brushes

To offset the injurious effects of vibration on carbon brushes, National Carbon Company, Inc., is prepared to supply brushes with a resilient pressure pad secured to the holder end at the point of contact with the pressure finger. The use of these pads, where vibration of great severity is encountered, materially reduces and may even eliminate such destructive effects as chipping and cracking of brushes, wear on the holder end of the brush and wear of the pressure finger tip.

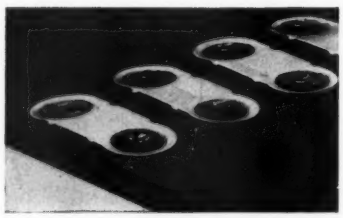
The resilient material used for these pads is very durable. Within the

range of temperature normally encountered on electrical equipment the pad will retain its resiliency throughout the life of the brush. The form of the pad and its exact location on the brush are dependent on the shape and dimensions of the pressure finger and the location of its contact with the brush. The style shown in the illustration is adapted to a wide range of brush holder designs.

Conveyor Belt Fastener

For joining the thin, light-weight conveyor belts that are growing more and more popular, Flexible Steel Lacing Company, 4607 Lexington Street, Chicago, Ill., has added a new size to the line of Flexco HD Belt Fasteners. This new size is known as the No. 1¼ and is used for joining elevator and conveyor belts from 5/16-in. to ½-in. thick. The holding bolts are large size, yet, because of its short length, the new fastener will travel around pulleys as small as 14 in. in diameter.

The new No. 1¼ is constructed and



applied in the same fashion as the other Flexco HD Fasteners. Metal plates span the joint on opposite sides of the belt and are drawn tightly together by two bolts through the belting. Bolt heads and nuts are countersunk and the protruding bolts are broken off; the fasteners are flat and smooth on both sides.

The Flexco HD Fastener makes a tight butt joint. The template locates the bolt holes slightly farther apart than the bolt centers of the fastener; when the bolts are inserted and drawn down into position the belt ends are forced together tightly, forming a compression seal that will not let material sift through. The completed joint, since it is a series of separate fastenings, can assume the trough of the conveyor as naturally as the rest of the belt.

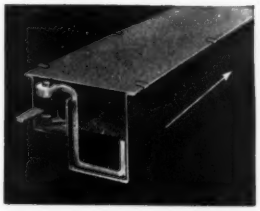
Flexco HD Belt Fasteners are furnished in either steel, Monel, Everdur or Promal, depending on the specific service conditions.

Conveyor Prevents Contamination

Absolute cleanliness and freedom from contamination are assured, according to Stephens-Adamson Mfg. Co., Aurora, Ill., in a new Redler Conveyor of their manufacture.

The new design is available in the horizontal closed circuit type Redler and features the driving chain moving in a compartment separate and distinct from the compartment handling conveyed material.

This construction is said to eliminate any metal-to-metal contact in the carrying run of this Redler, preventing possibility of dirt or lubricant



from contaminating material. Conveyed material is entirely free from the metal-to-metal contact of sprockets and chain, or chain and casing.

The new design of the horizontal closed circuit Redler does not add to the overall width or length of the conveyor because of the separate chain compartment; the addition in size of the casing is made on the inside of the circuit of the Redler.

This Redler is available in either the 90-degree or 180-degree type horizontal closed circuit Redler. In the 90-degree type, there are four corners, each curved at 90-degree angles. In the 180-degree type, the circuit is made with only two curved corners, each 180 degrees.

Further detailed information on the new type of Redler can be secured at the Aurora, Ill., main factory of Stephens-Adamson, or at their branch factories at either Los Angeles, Calif., or Belleville, Ontario, Canada, as well as at any one of their branch engineering sales offices.

Helmet With Hidden Hinge

Keeping pace with progress in the art of welding calls for advanced ideas in protective equipment for operators. Such an advance was noted recently in the introduction by Sellstrom Manufacturing Co., Chicago, of a welders' helmet made of a new material that very effectively insulates against heat and weighs only 15 ounces complete with lens and holder, as against the usual 20 ounces or more of the average helmet.

Lift-front types that give the operator a dense lens in the outer holder and a clear lens or less dense lens set in the inner holder have been popular with welders. In this type of holder, which requires spring or friction hinges that will hold the raised front firmly in position, a marked improvement is announced in the new Sellstrom Type "AA" Lens Holder. In this the inner and outer frames have concealed spring hinges which allow the outer holder to be raised or lowered in accurate positions. Incidentally, this type of holder is not riveted to the helmet but is interchangeable and is held in position by two screws.

Balanced Monobloc Pump

A new balanced Monobloc centrifugal pump, wherein the motor and pump have been engineered as an integral unit of balanced functional design in contrast to merely adapting a motor to a pump, is just announced by the Worthington Pump and Machinery Corporation, of Harrison, N. J.

This new pump is exceptionally compact, requiring a minimum of floor space, yet is provided with ample room for repacking the stuffing box. A shaft of large diameter, on rigid bearing mountings, maintains concentricity in all rotating parts, thereby increasing packing life. The new drip-proof motor features a directed flow of ventilating air which prevents drawing of moisture into the motor.

This new Monobloc unit is offered in sizes of 1 in. to 4 in., with capacities to 1,000 g.p.m. against heads up to 280 ft. It is available in bronze fitted, all-iron and all-bronze construction, horizontal or vertical mountings, with motor of any electrical characteristic.

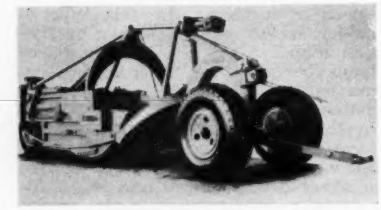
Complete details, ratings, and dimension tables are contained in the Worthington bulletin W-321-B14.

Scraper Features Larger Apron, Higher Sides

Another forward step in earthmoving trends by R. G. LeTourneau, Inc., of Peoria, Ill., introduces the latest and largest single bucket Carryall Scraper—the Model N—rated at 25.8 cu. yds. struck capacity and 33 heaped.

The Model N is designed for pusher loading. Constructed with higher sides and a larger apron to hold all of the dirt that the power of two tractors can dig, the Model N is intended to increase profits on large contracts, according to the manufacturer. A longer and steeper cutting blade base, facilitating easy and fast loading, causes material to boil in—to flow back into the bowl and forward into the apron. Cable controlled fractional inch cutting, positive ejection and measured spreading are attained through the instant response of the power control unit.

Several important new features are introduced by the Model N. Additional yards were added to its capacity by extending and building a higher apron. Instead of placing a lifting sheave on the apron where it would often be covered by and worked



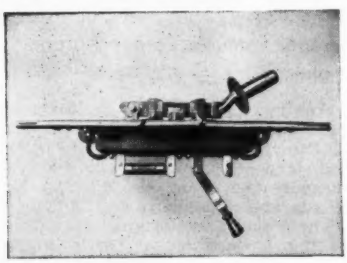
through dirt, the cable was dead-ended on the apron, and the apron sheaves placed on top of the spring pipe, where they travel back and forth in a slide—entirely eliminating abrasive cable wear caused by dirt getting into them. Easier passage of sticky materials is permitted by an arched "A" frame which also adds strength.

Ample flotation and needed compaction is obtained and resistance minimized by the use of four large 24 by 32 tires, 80 in. high. A goose neck yoke gives greater tire clearance.

Insulator Switch

A new Auxiliary Section Insulator Switch, designed to minimize electrical fire hazards and to protect electrical equipment in mines, has recently been placed on the market by the Mosebach Electric & Supply Co., 1152 Arlington Ave., Pittsburgh, Pa. Really two switches in one, the new unit consists of a standard type Mesco Insulator Switch combined with a smaller switch which can be fused for any desired load.

Chief advantage of the new Mesco Switch over ordinary switches is that, although high amperage load can be routed through the larger switch during working periods, this switch can be opened and the smaller one closed during shutdown periods. The small



switch passes sufficient ampere load to operate fans, small pumps, etc., but if the amperage is suddenly increased the fuse burns out, stopping all current and protecting the equipment at the face.

The auxiliary feature is now available on all standard Mosebach Section Insulator Switches, and can be supplied fused for either 220 or 550 volts. Durably constructed, the new switches are fitted with extra heavy contacts and blades, and with a locking device to prevent accidental closing. The manufacturer will be pleased to supply additional information and prices upon request.

CATALOGS AND BULLETINS

● COMPRESSORS. *Worthington Pump & Machinery Corp.*, Harrison, N. J. Folder on company's Streamlined Portable Compressor, Model 105. 1 page.

● CONCENTRATING EQUIPMENT. *Denver Equipment Co.*, Denver, Colo. Bulletin J2-B describes in detail the principle, mechanical construction, operation, and specifications of Denver Mineral Jigs, with detailed specifications of the various types, and illustrative material and flow sheets showing their application in different types of operation. 16 pages.

● CONVEYOR EQUIPMENT. *Goodman Manufacturing Co.*, Halsted St. & 48th Pl., Chicago, Ill. Bulletin CM-391 illustrates and describes company's complete line of conveyor equipment for coal mining under varying conditions. 20 pages.

The Jeffrey Manufacturing Co., Columbus, Ohio. Catalog 740 describes and illustrates company's complete equipment for conveyor mining, with numerous layouts and diagrams of typical working cycles. 68 pages.

Bulletin 741 describes the design and application of Jeffrey's Type 61-CL Conveyor Loader. 4 pages.

● CRUSHERS. *Allis-Chalmers Mfg. Co.*, Milwaukee, Wis. Bulletin B-6034 covers the four general types of Jaw Crushers; namely, fine reduction, Dodge, Blake, and Superior, illustrating and describing each, and including sketches showing the principles of operation. 28 pages.

Diamond Iron Works, Inc., Minneapolis, Minn. Bulletin 5-40-J on company's complete line of crushers, manufactured in sizes ranging from 9 x 16 to 10 x 24 in. 8 pages.

Catalog describes company's line of Jaw Crushers manufactured in sizes ranging from 9 x 16 to 15 x 36 in. 12 pages.

Traylor Engineering & Mfg. Co., Allentown, Pa. Bulletin 113 gives design advantages, performance data, and specifications for company's Multi-Stage Fine Reduction Crusher. 8 pages.

● DRILLING EQUIPMENT. *Ingersoll-Rand Co.*, Phillipsburg, N. J. Form 2410 illustrates and furnishes data on the many accessories necessary to efficient rock drilling, including such items as hose and couplings, air filters, grinders, steel cutters, air-line lubricators, and rock drill mountings. 12 pages.

Joy Manufacturing Co., Franklin, Pa. Form 5-M illustrates and describes the new Joy Safety Coal Drill. 8 pages.

E. J. Longyear Co., Minneapolis, Minn. Bulletin 57 on company's UG Straitline Diamond Core Drills. 8 pages.

Worthington Pump & Machinery Corp., Harrison, N. J. Pamphlet presents important features and specifications of company's No. 45 Rock Hammers. 4 pages.

Folder gives advantages and specifications of company's No. 180 Pneumatic-Feed Drifter. 2 pages.

Folder on company's Rock Master Model UPW Wagon Drill presents its advantages and specifications. 1 page.

● DUSTPROOFING MATERIAL *Calcium Chloride Association*, Penobscot Bldg., Detroit, Mich. Bulletin 37 contains latest information on methods of Calcium Chloride use for dustproofing and freeze-proofing treatment. 12 pages.

● EARTH-MOVING EQUIPMENT. *R. G. LeTourneau, Inc.*, Peoria, Ill. General catalog pictures and describes company's entire line of Bulldozers, Angledozers, Rooters, Carryall Scrapers, Sheep's Foot Rollers, Pushdozers, Treedozers, and Tractor Cranes, together with services offered by the company. 32 pages.

● EXPLOSIVES. *Atlas Powder Co.*, Wilmington, Del. Catalog No. 9 gives complete information about company's entire line of explosives. Products available for specialized fields are grouped for ready reference, with descriptions of the properties of each explosive. 44 pages.

● HOISTS. *American Hoist & Derrick Co.*, St. Paul, Minn. Bulletin 100-H-O features company's new Model 20 American General Purpose Hoist. 4 pages.

● LOCOMOTIVE ACCESSORIES. *The Jeffrey Mfg. Co.*, Columbus, Ohio. Folder 742 describes the construction and operation of Jeffrey Hydraulic Braking System for installation on mine locomotives. 4 pages.

● MATERIAL-HANDLING EQUIPMENT. *The Cleveland Crane & Engineering Co.*, Wickliffe, Ohio. Form G-237 describes how to plan a materials-handling system for various industrial set-ups. 8 pages.

Robins Conveying Belt Co., New York City. Bulletin 109 briefly describes company's complete line of material-handling equipment. 4 pages.

● MOTORS. *General Electric Co.*, Schenectady, N. Y. Bulletin 1368-D gives information on the construction features and the advantages and uses of G-E Vertical Hollow-Shaft Induction Motors. 4 pages.

Bulletin 1412-B lists advantages of G-E Vertical Solid-Shaft Induction Motors. 6 pages.

Bulletin 3223 presents company's Type KC Single-phase Vertical Motors. 2 pages.

Bulletin 3345 describes Synchronous Motors and Control for Part-Winding Starting. 4 pages.

Bulletin 3352 gives important features of company's Fractional Horsepower Sump Pump Motor—a packaged unit ready to assemble on your pump. 2 pages.

● PREPARATION EQUIPMENT. *Koppers Rheolaveur Co.*, Pittsburgh, Pa. Form E-4 on company's Coarse Coal Preparation Equipment for Improving Quality and Uniformity of Coal. 8 pages.

Form E-5 describes Coal-Preparation Equipment for Improving the Quality and Uniformity of Fine Coal. 4 pages.

Form E-6 describes the Koppers Menzies Cone Separator for Coal Preparation. 4 pages.

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill. Folder 1821 describes the Link-Belt-American System of Pneumatic Coal Cleaning, which dedusts and drys as it cleans. 4 pages.

● SAFETY EQUIPMENT. *The Boyer-Campbell Co.*, 6540 Antoine St., Detroit, Mich. Catalog 40 describes and illustrates company's complete line of equipment used in promoting safety. 128 pages.

● SCRAPERS AND SHEAVE BLOCKS. *Alloy Steel & Metals Co.*, 1862 E. 55th St., Los Angeles, Calif. Bulletin 95 announces important improvements in Pacific all-manganese steel scrapers for underground slushing operations. 8 pages.

Bulletin 96 describes and illustrates the new Pacific Sheave Blocks of improved design particularly adapted for use with slushing scrapers.

● WASHROOM FIXTURES. *Bradley Washfountain Co.*, Milwaukee, Wis. Form P-225 presents typical washroom layouts as drawn by company's engineers during 18 years of specialization in this field. 12 pages.

Catalog 937 describes and illustrates company's complete line of modern washroom equipment. 28 pages, plus 4-page supplement.

● WOOD PRESERVING. *The Wood Preserving Corp.*, Koppers Bldg., Pittsburgh, Pa. Form G-12 discusses economics of wood preservation in underground coal mining. 8 pages.

Now FORMEX MAGNET WIRE HERE

Reg. U. S. Pat. Off.

IN G-E DIRECT-CURRENT MINE MOTORS FOR LONG INSULATION LIFE UNDER SEVERE OPERATING CONDITIONS

Stator assembly of typical G-E direct-current mine motor

IT'S not just the moist, corrosive atmospheres of many coal mines that's so tough on the motor insulation in direct-current mine motors. It's also the voltage surges on the underground circuits, the frequent overloads, the across-the-line starting of larger motors, and low voltage at the mine face. All of these cause either mechanical shock or injurious overheating, and that makes it hard for the insulation, particularly of the field coils, to stand up for even a normal period of service.

That's why General Electric is now using Formex magnet wire for the main field coils of its direct-current mine motors.

"Formex" identifies a new G-E magnet wire insulated with a synthetic resin of the vinyl acetal type. It is a product of many years' research and experimentation by G-E engineers and scientists.

Physically, Formex has outstanding qualities. It retains the high dielectric strength of conventional enamel. It is at least three times tougher and more flexible and much more resistant to abrasion. It shows no tendency to become brittle, crack, and lose its toughness on long exposure to heat.

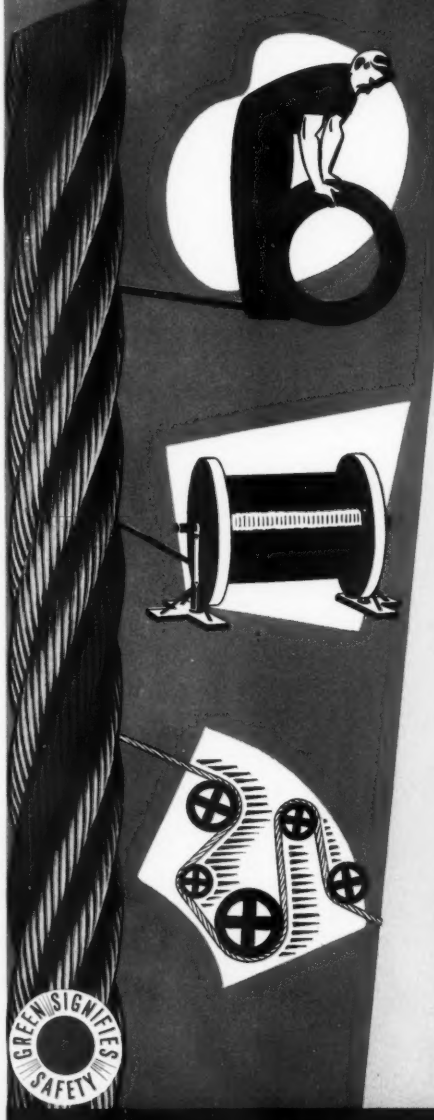
Another advantage of Formex is that it is resistant to the solvents used in the treating varnishes that are applied to winding assemblies.

Think what just this one feature of G-E direct-current mine motors means! Fewer repairs and replacements, greater assurance of continuous operation, lower costs per ton of coal mined! Why not plan now to get these advantages? You need only specify "General Electric motors" in your equipment order. Or, if you prefer, talk over your requirements with our nearest representative. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

INDEX TO ADVERTISERS

"DO'S" and "DONT'S" for Re-Roping



The service life of a wire rope begins at the start of the reeving job. Here are a few practical pointers to remember when reeving wire rope.

- If your rope is in a coil—don't pull the rope out of the coil. Roll the coil away from the rope end—allowing the rope to pay out in a straight line.

- If your rope is on a reel—align the reel with the drum and keep a constant tension on the spool to avoid slack in the line. Don't pass the rope around a lead sheave so small it will put a set or crimp in the rope.

- Wherever possible avoid reverse bends. In many installations, of course, reverse bends cannot be avoided. In such cases the life destroying effect of reverse bending can largely be nullified by the use of TRU-LAY Preformed Wire Rope. Because it is preformed, TRU-LAY possesses amazing resistance to bending fatigue and invariably gives far longer service.

- ***On any wire rope problem your nearest American Cable representative can help you.***

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PICTURE yourself in the miner's place—in total darkness except for the light your cap lamp provides. It is very evident that how well you can *see* means how safely and well you can *work*.

If you enjoy the finest available illumination, better directed to the job, unfailingly dependable through every working minute—combined with perfected head protection—you'll be wearing an Edison Electric Cap Lamp and M.S.A. Skullgard; you'll *produce* more for your company; you'll notably lessen the chances for injury to yourself and expense to your employer, and you'll work in greater comfort.

These are the facts, proved by more than 450,000 Edison Lamp and Skullgard users in the mines of the world. An on-the-job demonstration of the Edison Electric Cap Lamp and M.S.A. Skullgard is yours on request at any time, without obligation!

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